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Canada, Dominion Forest Service

DEPARTMENT OF THE INTERIOR, CANADA

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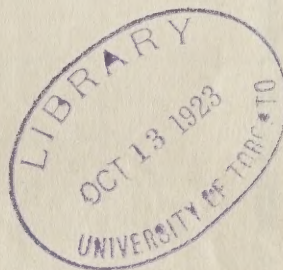
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THE  
FORESTS OF CANADA

*Their Extent, Character, Ownership,  
Management, Products, and  
Probable Future*



Prepared in co-operation with the Dominion Bureau of Statistics

OTTAWA  
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# THE FORESTS OF CANADA

## 1—General Description of Canada From a Forestry Viewpoint

The Dominion of Canada may be roughly divided topographically into three main drainage areas. The country west of the Continental Divide, formed by the Rocky mountains, slopes generally towards the west, and its rivers, with minor exceptions, flow into the Pacific ocean. The vast interior portion of the Dominion slopes in a northerly direction and its rivers empty into the Arctic ocean or Hudson bay. The International Boundary from the Great Lakes to British Columbia follows roughly the dividing line between this basin and that of the Mississippi river to the south. The St. Lawrence river and the Great Lakes form a basin which drains into the Atlantic ocean.

The Pacific slope is characterized by numerous ranges of mountains running in a general north-westerly direction parallel to the coast and at right angles to the prevailing warm, moist, westerly winds. These mountains are called the Cordilleras in Canada, of which the Rocky mountains form the eastern and most prominent system. The Rocky mountains vary in elevation from 5,000 to 13,000 feet above sea-level and many of the peaks exceed 11,000 feet. Between the Rocky mountains and the Pacific are the Columbia system, comprising Selkirk, Monashee, and Cariboo mountains; the Interior Plateau system, including the Fraser and Nechako plateaux; the Cassiar system, comprising the Stickine, Babine and other mountains; the Yukon system; Pacific system, comprising the Cascade, Coast and Bulkley, and other mountains; and the Insular system, which is represented by the Vancouver Island and the Queen Charlotte Island mountains.

Between the principal mountain ranges there are broad, well drained U-shaped trenches, the chief of which are the Rocky Mountain, the Purcell, the Selkirk, and the Coastal trenches. These valleys are of great strategic value from the standpoint of the exploitation of the forests, for not only do they contain the principal waterways, but they provide means of access by roads and railways to the vast interior resources in lands, mines, and forests.

Several of the larger rivers, such as the Fraser, Skeena, and their tributaries, break through connecting valleys from one trench to another, and supply shorter routes of communication between the intermontane trenches and the ocean ports.

The agricultural land throughout, which comprises approximately 6 per cent of this region, is confined chiefly to the valley bottoms and alluvial deltas.

The Rocky mountains and the islands on the coast are formed chiefly of Palaeozoic rocks. The Coast range is almost entirely granitic in formation, and the Selkirks are almost entirely Pre-Cambrian or Cambrian. The intervening ranges are of mixed formations varying from rocks of sedimentary origin to granites.

The climate of the coast is mild and humid, very similar to that of the south of England. The mean annual temperature varies from 44° to 49° F., with a summer mean of 55° to 61° and a winter mean of 30° to 38°, according to the latitude. The precipitation is the heaviest in Canada, and varies from 40 to 120 inches, depending on the position of the minor ranges of the Coast mountains, which by intercepting the west winds blowing from the Pacific cause them to discharge the greater part of their moisture. The major part of this precipitation, however, does not occur during the growing season but occurs during the fall and winter, only 30 per cent falling during the spring and summer. This is sometimes given as a reason for the prevalence of coniferous forests in the province, it being claimed that the "hardwoods" or deciduous-leaved trees require more moisture during the growing season. The coniferous trees in this region grow most luxuriantly and the largest individual trees as well as the heaviest stands of timber are found in this part of Canada.

The Dry Belt or semi-arid region of the Interior Plateau system is characterized by a very low annual precipitation, varying from 10 to 20 inches. The temperature is more extreme in this dry region with a maximum of 100° F. and a minimum of -45°. This climate is naturally less favourable to tree growth and a marked difference is noted between the existing forests of this region and those of the coast.

The winds from the Pacific, after crossing this plateau, strike the Selkirk and Rocky Mountains and precipitate a large part of their remaining moisture, producing what is known as the Interior Wet Belt of the province. The precipitation varies from 30 to 60 inches but in the higher altitudes a large portion of this is in the form of snow. Extremes of temperature recorded vary from 100°F. to -17°, showing a more temperate climate than that of the Dry Belt.

In the Rocky Mountain system itself the climate is more extreme and variable than in any of the western parts of the province. Precipitation varies from 14 to 20 inches and the temperature ranges from 103°F. to -51°.

To the east of the Rocky Mountains stretches the great interior basin already referred to. It is composed of a number of different types of topography. From the foot-hills of the Rockies the country slopes gradually eastward and northward changing from rolling to flat prairie in the southern part. The plains and prairies extend from the International Boundary to the 55th parallel of latitude along the foot-hills, and gradually taper down to a point in the neighbourhood of the Lake of the Woods. This area is almost entirely treeless. It is covered by rich, fertile soil and is a purely agricultural and pastoral country.



The underlying rocks are of sedimentary origin of the Tertiary and Mesozoic ages. The climate of Alberta is extremely variable in winter due to a warm, dry wind known as the "chinook," which blows from the south and southwest and extends its influence from the International Boundary to the Peace river and eastward as far as Regina in Saskatchewan. In summer the isotherms run almost due north and south in Alberta. Rainfall varies from 15 to 20 inches.

Temperature in Manitoba has an absolute recorded range of 150°F. with a mean of 71°. Saskatchewan and Alberta are more temperate where they are affected by the chinook.

To the north of the prairies is a vast region to a great extent unexplored. The country, generally speaking, is a plain sloping northward toward the Arctic. In its southern parts it is covered by forest of secondary commercial value at the present time.

The soil over a large portion of this area is suitable for agricultural purposes but toward the north and east the climate is usually too extreme for the profitable raising of crops. Toward the north and east the forest gives place to the sub-Arctic "tundra," a region of bog and bare glacier-worn rocks of the Laurentian and Pre-Cambrian types.

These Laurentian rocks are known in Canada as the Archaean or Canadian Shield. It is in the shape of a huge irregular triangle with its apex in the neighbourhood of the Thousand islands in the St. Lawrence from which point the two sides extend, one northwesterly to the mouth of the Mackenzie river, and the other northeasterly down the St. Lawrence valley and includes the Labrador peninsula. This enormous peneplain of the Canadian Shield is covered with innumerable lakes, swamps, bogs, and rivers. It is heavily forested in the south but in the north and in that portion surrounding Hudson bay and James bay it is of the tundra type described above.

The whole region has been reduced to the peneplain condition by glacial action, which has worn down the high elevations and removed most of the soil, except in isolated depressions and small valleys. The climate in the northern part is, as a rule, too severe for successful agriculture. The southern portion including the Clay Belt in northern Ontario and the southeastern part of the province is to a great extent agricultural land either actual or potential, much of it still being heavily forested.

The basin of the St. Lawrence river and the Great Lakes contains a variety of topographical and geological types. The north shore of lake Superior and Georgian bay, the upper Ottawa River valley and the southern part of Labrador are a part of the southern Laurentian type of country already described. Here the climate is tempered in part by the presence of the Great Lakes and the gulf of St. Lawrence, but it is nevertheless severe and variable. To the south the climate is milder, the soil is deeper and more fertile, and the southwestern peninsula of Ontario, the north shore of lake Ontario, and the St. Lawrence valley are essentially agricultural. Here the rock formation is of sedimentary origin of the Palaeozoic Age.

The Maritime Provinces should perhaps be considered separately. The rock formation in New Brunswick is largely Mesozoic with areas of granite. In Nova Scotia the proportion of granite is greater with large areas of late Pre-Cambrian or Cambrian rocks. The most fertile valleys in both provinces are underlain with Mississippian Palaeozoic rock.

Prince Edward Island is built up entirely of Permian and Upper Carboniferous rocks. The climate of the Maritime Provinces is somewhat similar to that of southern Ontario, being modified by the presence of the Atlantic. The precipitation for the three provinces is above 35 inches, with the heaviest rainfall of 50 inches along the south shore of Nova Scotia.

## 2—Main Types of Forest Growth

The forests of Canada may be divided into three main regional groups, namely, the Cordilleran, the Great Plains and the Eastern forests.

### CORDILLERAN REGION

The Cordilleran region includes the Coast Belt, the Interior Dry Belt, the Interior Wet Belt, and the Rocky Mountain Belt. Within each of these belts, several distinctive forest types occur, their character being determined by varying climatic and physiographic conditions. This region is characterized by great variations in altitude and moisture conditions which influence arborescent growth.

#### COAST BELT

##### *Douglas Fir-Red Cedar Type—*

In the southern portions of the Coast Belt, the Douglas fir-western red cedar type generally extends from sea-level to 2,000 or 2,500 feet altitude. Towards the northern limit the altitudinal range decreases. Associated with the principal species are western hemlock, western white pine, and balsam fir (lowland fir and amabilis fir).

##### *Red Cedar-Western Hemlock Type—*

As the Douglas fir disappears from the stands towards the north or at higher altitudes, the forest changes to a red cedar-hemlock type with amabilis fir and yellow cypress as subsidiary species. This type descends to sea-level between Knight's inlet and Rivers inlet on the main land and Barkley sound and Quatsino sound on Vancouver island. It has an altitudinal range of from 1,500 to 3,000 feet above sea-level.



*Western Hemlock-Sitka Spruce Type—*

The Western Hemlock—Sitka Spruce type is a lowland type prevalent in the northern portion of the Coast belt between Rivers inlet and Portland canal and especially on the Queen Charlotte islands. It also occurs on well watered situations along valley bottoms within the range of the Douglas fir.

*Western Hemlock-Balsam Fir Type—*

Occupying a climate zone somewhat less favourable than the red cedar-hemlock or the hemlock-Sitka spruce types, the hemlock-balsam fir type occurs either on higher or more exposed or wetter sites. It has an altitudinal range of from 1,500 to 3,500, or, in some situations, 4,000 feet. It is not present on the Queen Charlotte Islands.

*Sub-Alpine and Muskeg Type—*

At higher elevation between the merchantable timber line and the cold timber line there is a sub-alpine type of stunted tree growth, composed chiefly of mountain hemlock, yellow cypress, and alpine fir, with occasionally, red cedar, lodgepole pine, or white-barked pine. A similar type is found on very wet or exposed situations at lower elevations along the coast.

*Deciduous Type—*

On the alluvial bottomlands of many of the larger valleys, stands of black cottonwood occur. It is associated with alder and broad-leaved maple. This is typically a pioneer type on newly formed land.

*Treeless Type—*

In the lower portions of the valleys in the southern part of the Interior Plateau, there is a treeless type characterized by a growth of sagebrush (*Artemisia tridentata*) in the driest situations in the bottoms of the valleys and by bunch grass (*Agropyron spicatum*) on the higher mountain sides and benches. The land is very fertile when irrigated and the bunch grass provides excellent grazing.

*Yellow Pine Type—*

Bordering on the grass lands, open park-like stands of western yellow pine occur, becoming denser as the elevation and moisture increase until fairly dense stands develop. This type usually occurs at altitudes between 1,500 and 2,500 feet above sea-level, but may extend to 3,000 feet on southern exposures.

*Interior Douglas Fir Type—*

As the altitude increases, Douglas fir gradually becomes more prominent in the yellow pine type until it becomes predominant. It extends to elevations of 3,500 to 4,500 feet. The Douglas fir of the Interior differs markedly from that of the Coast Belt. It is smaller, shorterboled, and more limby, and is much hardier when subjected to extreme climatic conditions.

*Douglas Fir-Western Larch Type—*

In the southeastern part of the Interior Dry belt, this type covers a limited area usually between the yellow-pine and Douglas-fir types. Forest fires have played an important part in the formation of this type, since the thick bark of the larch makes it more resistant to fire than the concomitant species.

*Engelmann Spruce Type—*

At the upper altitudinal and latitudinal limits of the Douglas fir type, the Engelmann spruce type develops. This type merges into a spruce-alpine fir type and finally the sub-alpine type.

*Lodgepole Pine Type—*

As a result of repeated fires, lodgepole pine has replaced the original forests to a very considerable extent in the Douglas fir and Engelmann spruce types, and has also encroached on the yellow pine type. The transformation has been so extensive and so complete that lodgepole pine must be considered as an established type from a managerial aspect. In many places reproduction of Douglas fir and Engelmann spruce is present under the lodgepole pine, giving promise, if afforded protection from fire, of the final reversion to the climax type.

## INTERIOR WET BELT

*Interior Red Cedar Type—*

The increased precipitation in this belt has resulted in the development of forest types similar to those found on the Coast. In the wetter situations in the valleys, red cedar becomes the predominating species. In the southern portion of the belt it is associated with Douglas fir, Engelmann spruce, western white pine, hemlock, larch, lowland fir, alpine fir, and cottonwood. Farther north, alpine fir and Engelmann spruce become more prominent and the other species drop out of the type.

*Red Cedar-Hemlock Type—*

On the benches and lower slopes of the valleys in the southern portion of the Interior Wet belt, red cedar and hemlock are the principal species. The altitudinal range of this type is between 3,000 and 4,000 feet.



*Red Cedar-Engelmann Spruce Type—*

Engelmann spruce replaces the hemlock at higher elevations and finally the cedar is eliminated and the Engelmann spruce-alpine fir type extends to the limit of commercial tree growth.

## ROCKY MOUNTAIN BELT

The forests on the Rocky Mountains present a varied character. On the southern portion of the Rocky Mountain trench, typical dry-belt conditions exist and the yellow pine type extends as far north as the Kootenay river. North of this the Douglas-fir type extends to Golden, and beyond this, to the junction of Bear and Fraser rivers, the red cedar types of the Interior Wet Belt occur.

*Engelmann Spruce Type—*

Excluding those portions belonging ecologically to the Interior Dry and Wet belts, the climax type of the Rocky Mountain belt is Engelmann spruce, with an increasing proportion of alpine fir at higher altitudes.

This type has suffered so severely from fire, especially on the drier eastern slopes, that lodgepole pine has become established over large areas in many places to the expulsion of the original species. In others the spruce will eventually gain supremacy.

## GREAT PLAINS REGION

The Great Plains region may be divided into the Prairie, Northern forest, and Sub-Arctic belts. There are no great variations in altitude in this region, and soil conditions and latitude are chief determining factors in the distribution of the forest types.

## PRAIRIE BELT

In the southern portion of the provinces of Alberta, Saskatchewan and Manitoba, there is a vast area extending north of the International Boundary for 200 to 400 miles which is practically a treeless prairie. The occurrence of scattered patches of tree growth adjacent to natural fire-breaks such as streams and hills would indicate that fires have been responsible to a large extent, if not entirely, for the present treeless condition of this area. Aspen is the most prevalent species in these "bluffs" that remain, but in some places white spruce and jack pine occur. The land in this belt is of value primarily for agriculture.

## NORTHERN FOREST BELT

North of the Prairie Belt there is a forest belt 300 to 400 miles wide with an intervening narrow transition zone, partly prairie and partly forest. This forest belt covers the Archaean rocks and the soil is not suited to agricultural development.

*White Spruce Type—*

From a commercial standpoint, the most important type in these forests is the white spruce type. Though it has been decimated by fire, most of the logging operations are conducted in this type. Under natural conditions it occupies the heavier, well drained soils. Balsam fir is frequently associated with white spruce, especially in the eastern portion of the belt.

*Black Spruce Type—*

Black spruce, either pure or associated with eastern larch (tamarack), is found on poorly drained lands which comprise a considerable portion of the area.

*Jack Pine Type—*

Like the lodgepole pine to which it is closely related, jack pine has gained ascendance over the spruce through the agency of fire. In some situations, especially on the lighter soils, it has formed a permanent managerial type, but on others it may be considered a temporary type.

*Intolerant Hardwood Type—*

So severely have the coniferous forests suffered from fire that aspen has become the most prevalent species throughout the Northern Forest belt. Though it will eventually be replaced by conifers where there is a possibility of securing reproduction of these species, over vast areas there is no immediate prospect of securing a coniferous forest by natural agencies. In the eastern portion of the belt, white birch is frequently associated with the aspen, and on moist situations, such as along streams, balsam poplar occurs.

## SUB-ARCTIC BELT

In the northern part of this region, open tundras become more prevalent and tree growth is confined to narrow strips bordering the waterways. The occurrence of trees of 12 to 16 inches in diameter, even as far north as Fort McPherson ( $67^{\circ} 25' N.$ ), would indicate that soil conditions and perhaps fire have had more influence than climatic conditions in the limitation of forests.

As we go north, balsam fir early disappears from the forest. It is followed by balsam poplar, jack pine, aspen, and white birch the most persistent species being white spruce, black spruce, tamarack and willow. The northern limit of tree growth may be roughly indicated by a line drawn from the mouth of the Mackenzie river on the Arctic ocean to the mouth of the Churchill river on Hudson Bay, and across the Labrador peninsula at about  $58^{\circ} N.$  latitude.



The timber in this sub-Arctic belt, though of little importance from the standpoint of forest industries, is of great value as a source of supply for local needs and for the protection of game and fur-bearing animals.

## THE EASTERN REGION

In the eastern forests, several zones or belts of distinctive characteristics are recognized, the Carolinian, Hardwood, Acadian, Mixed Hardwood-Softwood, Northern and Sub-Arctic Forest belts.

### CAROLINIAN BELT

This zone is confined to the southwestern portion of Ontario bordering on Lake Erie and the western part of Lake Ontario. It is characterized by the presence of several species of hardwoods seldom or never found elsewhere in Canada. These are the tulip tree (*Liriodendron Tulipifera*), Sycamore (*Platanus occidentalis*), sassafras (*Sassafras variifolium*), chestnut (*Castanea dentata*), black gum (*Nyssa silvatica*), papaw (*Asimina triloba*), black walnut (*Juglans nigra*).

### TOLERANT HARDWOOD BELT

North of the Carolinian zone from lake Huron to the Eastern Townships in Quebec, the forests were composed primarily of such hardwoods as maple, elm, beech, basswood, ash, yellow birch, oak, hickory and butternut, which are classed as tolerant on account of their shade-enduring abilities as contrasted with the light-demanding species, poplar and white birch.

Coniferous types occur within these two hardwood belts, but are usually confined to swampy or light soils. The land throughout these belts is of high agricultural value, and only remnants of the original forests are found in farmers' woodlots.

### ACADIAN BELT

The Acadian belt includes the Maritime provinces and the south shore of the St. Lawrence river in Quebec. It is characterized by the occurrence of red spruce, and the forests resemble those of the states of Maine, Vermont, New Hampshire, and New York. White spruce is present in these forests, but it is not so prevalent as red spruce. The principal forest types in this belt are the spruce-balsam fir type, the tolerant hardwood type, the mixed hardwood and softwood type in which white pine and hemlock occur, and the black spruce and cedar types which occupy the poorly drained sites. The temporary intolerant hardwood type of aspen and white birch is prevalent on burned-over areas.

#### *Mixed Hardwood and Softwood Type—*

Adjoining the Hardwood belt is a Mixed Hardwood-Softwood belt which extends to a line running roughly from the northeast corner of Lake Superior to the north of the Saguenay river on the St. Lawrence. It is in this belt that the white pine reached its maximum development, and though since the beginning of the lumber industry in Canada this region has been the centre of the most extensive exploitation it still occupies a premium position in forest production in eastern Canada.

The character of the forests in this belt has been greatly altered by cutting and fire. The valuable pines to a larger extent have been replaced by spruce, balsam fir, jack pine and hardwoods. The forests in this belt contained a great number of species, comprising several types which are determined primarily by soil conditions.

#### *Pine Type—*

Red pine is frequently, but not always, associated with white pine in this type. On light soils pure stands of pine occur, but on heavier soils there is usually an admixture of shade-tolerant species, such as spruce, hemlock and yellow birch, maple, beech and other hardwoods which occupy a minor position in the stand. The exclusive cutting of pine, which until recently has been generally practised in these forests, has resulted in the displacement of the pine by the concomitant species.

#### *Tolerant Hardwood Type—*

Almost pure stands of hardwood composed of maple, yellow birch, elm, ash, basswood, beech, etc., are becoming more widely established. Under undisturbed conditions "hardwood ridges" carrying chiefly maple and yellow birch occur throughout this belt.

#### *White Spruce-Balsam Fir Type—*

This type, though common in the virgin forests, has become more prevalent since the removal of the pine and on account of its value as pulpwood is now the most valuable type in this belt.

#### *Black Spruce Type—*

Black spruce, usually associated with tamarack and white cedar, forms the typical stands of the swamps and low ground.

#### *Jack Pine Type—*

Fire has resulted in the establishment of jack pine over very considerable areas in this belt. In some cases it is only a temporary type, but in others it has taken almost complete possession, especially on light sandy or gravelly soils. The value of jack pine for railway ties and pulpwood and the ease with which it can be grown render it not an undesirable species to perpetuate.



*Intolerant Hardwood Type—*

Aspen and white birch comprise a widely distributed fire type, which is for the most part temporary in character, since coniferous reproduction is generally present and will eventually dominate these short-lived species.

TRANSITION BELT

Between the northern limit of the tolerant hardwoods and the height of land separating the St. Lawrence and the Hudson bay drainage areas, and including the Lake-of-the-Woods drainage area in western Ontario, there is a forest belt which resembles the Mixed Hardwood-Softwood belt, except that the tolerant hardwoods are absent. White pine, red pine, white spruce and balsam fir are normally the prevailing species, but the jack pine and intolerant hardwood types are prominent on old brûlés, and black spruce and tamarack in the swamps.

NORTHERN FOREST BELT

North of the height of land, the forests change to the northern forest types similar to those in the Great Plains region. Though white and red pine do occur for some distance north, they are an unimportant factor in the forests. Black spruce becomes more prevalent owing to the extensive areas of poorly drained lands. Jack pine is plentiful on higher and drier sites and the aspen-white birch type is widely distributed, the proportion of white birch increasing towards the east.

SUB-ARCTIC BELT

The forests for approximately 100 miles south of Hudson bay belong to the sub-arctic belt and are for the most part confined to the better drained lands along the rivers. They are of the same composition as in the northern part of the Great Plains.

3—Area Covered by Existing Forests

The areas of agricultural and forest lands can only be estimated, as systematic land classification has been attempted only on limited areas and for a large part of the Dominion only very meagre information is available.

Of the total area in Canada (3,729,665 square miles) over 100,000 square miles is covered by lakes and rivers, leaving a land area of approximately 3,600,000 square miles. The area suitable for agriculture, including grazing lands, is estimated to be 469,000 square miles, of which only 93,180 square miles were devoted to field crops in 1921.

Approximately one-quarter (950,000 square miles) is forest land; less than half of this carries timber of merchantable size (6 inches in diameter) at the present time, and only about one-quarter carries saw material (10 inches in diameter).

The balance of the forest land is for the most part covered with young stands of various ages which have come up after fire or cutting. On a considerable proportion of this area the succeeding stands are inferior to the original forests and are composed of the temporary fire types of poplar and white birch, or jack or lodgepole pine. There are, however, large areas of the more valuable coniferous species which in time will be available for use.

Accessibility is dependent primarily on the market standards, price of forest products and transportation facilities. All of these factors are changing in the direction of increasing the extent to which the timber can be utilized. Under the present conditions perhaps one-quarter of the timber of merchantable size is commercially inaccessible, so that the forests on about two-thirds of the forest land are either too small or too expensive to operate profitably. This is not a permanent condition since new areas are being opened up for exploitation by the extension of the railways and the improvement of waterways; new industries provide increased markets, and advancing prices permit of more expensive logging operations. The young stands as they reach maturity will be available.

It would not be safe to predict that more than ten per cent of the forest area will ultimately be classed as unprofitable or inaccessible.

TABLE 1—STATEMENT SHOWING THE TOTAL AREA OF FOREST AND THE PERCENTAGE OF THE LAND AREA COVERED BY FOREST

—	Agricultural Land	Forest			Other lands	Total
		Merchant- able	Unprofitable or inaccessible	Total		
	1	2	3	4	5	6
Square Miles.....	431,700	456,800	739,125	1,195,925	1,975,711	3,603,336
Percentage of total area.....	12	13	20	33	55	100.00

Cols. 1, 2, 4 and 6—Estimates based on available information.  
Cols. 3 and 5—Figures obtained by subtraction from total.



#### 4—Important Timbers and Other Forest Products

The principal forest products of Canada are sawn lumber and pulpwood and the species or groups of species described below are arranged in order of their importance as the sources of these products. Other important products are fuel-wood, railway ties, poles, piles, mine timbers, fencing material, wood for distillation, tan-bark, maple sugar and syrup. Other minor products are Canada balsam, spruce gum and nuts.

There are approximately 160 aborescent species of hardwoods and 31 coniferous softwoods in Canada, but of these only 23 species of softwoods and 32 species of hardwoods can be considered as commercially important. The conifers form over 80 per cent of the standing timber and 95 per cent of the lumber and pulpwood produced. The hardwoods are chiefly used for fuel, but they also furnish considerable lumber for flooring, interior finish, cooperage, turnery and other wood-working industries.

##### SPRUCE

Spruce is found in all the forest regions of Canada, and it is not only the most abundant but is the principal wood used in the manufacture of both lumber and pulp. There are five indigenous species, all of which are commercially valuable.

**White spruce** (*Picea canadensis*) occurs in every province and extends to the northern limit of tree growth. The wood is light in colour and weight, straight-grained and comparatively soft and is an excellent material for general light construction purposes. It is to a large extent taking the place of white pine. It possesses long, tough, easily bleached fibre which renders it especially valuable for the manufacture of paper.

**Red spruce** (*Picea rubra*) is confined to the Maritime provinces and the southeastern portion of Quebec. It is similar in general characteristics and uses to the white spruce, but the wood is somewhat darker in colour, finer in grain, and stronger.

**Sitka spruce** (*Picea sitchensis*) is confined to low altitudes in the Pacific Coast belt. It is a very large tree, frequently reaching six feet in diameter. The wood is light and strong and is considered the best wood in the world for the manufacture of aircraft. It is also an excellent pulp material.

**Engelmann spruce** (*Picea Engelmanni*) is found in the interior portions of the Cordilleran region. It grows to a larger size than white or red spruce but not so large as Sitka spruce. The wood is similar to white spruce. It is a valuable source of lumber, but has not yet been used extensively for pulpwood owing to the lack of development of the pulp and paper industry in the region which it occupies.

**Black spruce** (*Picea mariana*) is a smaller species, usually confined to poorly drained sites. It is widely distributed and extends to the far north. Though occasionally used for lumber, it is especially valuable for pulpwood, as it makes an excellent grade of paper.

##### PINE

There are eight species of pine in Canada but only five are of commercial importance.

**White pine** (*Pinus Strobus*) is the eastern species of white pine. The commercial stands occur in the Lake-of-the-Woods and the St. Lawrence drainage areas and in the Maritime Provinces. It was at one time the principal lumber species in Canada but the supply has become so depleted that spruce and Douglas fir have surpassed it in quantity production. It is the most valuable softwood in Canada, and is exceeded in average value only by walnut, chestnut and oak.

The wood is light in colour, strong in relation to its light weight, straight-grained, soft, and very fine and even in texture. It is especially noted for the ease with which it can be worked and for the fact that, when properly seasoned, it swells and shrinks very little when subject to changes of humidity. It is highly prized for building construction, interior finish, pattern, and cabinet work, but is not used for pulp. The trees attain a height of from 100 to 150 feet and a diameter of 3 to 4 feet.

**Western white pine** (*Pinus monticola*) resembles in its general characteristics and uses the white pine of the east. It is confined to the more humid situations in the Coast and Interior Wet belts in British Columbia. It seldom forms a high proportion of the stand and the available supply is limited, so that it is not of such commercial importance as the eastern species.

**Red pine** (*Pinus resinosa*) is often known as "Norway pine". It is found throughout the same region as white pine in eastern Canada and is frequently associated with it, though it does occur in pure stands. It is a hardier tree and has a somewhat wider range. It does not attain such large sizes as white pine, and the wood is heavier, harder and more resinous, but it is used for the same purposes.

**Western yellow pine** (*Pinus ponderosa*) is confined to the Interior Dry Belt in British Columbia where it grows in open park-like stands. The wood is intermediate in quality between white pine and red pine, and is used chiefly for light construction and interior finish. Mature trees are usually 18 to 40 inches in diameter and 60 to 100 feet in height. Though limited in distribution, it is an important source of lumber.



**Jack pine** (*Pinus Banksiana*) is widely distributed throughout the forests of Canada from the Rocky Mountains to the Atlantic. It is a small tree, seldom over 2 feet in diameter, but on account of its habit of growing in dense stands, it is usually tall and straight. It is very hardy and its wonderful reproductive power and the ability of the cones to withstand a severe fire without injury to the seed have enabled it to replace the originally dominant species on large areas of brules.

The wood is coarse, hard, and not very strong as compared with the other pines and though sawn to a limited extent for lumber, its chief use is for railway ties, mine props, and poles, for which purposes it is especially adapted. It is also used to a considerable extent in the manufacture of kraft paper, and with improvement in the other processes of making pulp its use as pulpwood promises to be greatly increased. Though formerly considered a forest weed, it is becoming one of the most important species silviculturally and industrially.

**Lodgepole pine** (*Pinus Murrayana*) is the western species of jack pine occurring throughout British Columbia and on the east slopes of the Rockies in Alberta. Its characteristics of growth, quality of wood and uses are almost identical with those of jack pine.

## DOUGLAS FIR

**Douglas fir** (*Pseudotsuga taxifolia*) is the only species of its genus represented in Canadian forests. It is confined to the Cordilleran region, occurring in the southern portion of the Coast belt, throughout the interior of British Columbia as far north as the 56th parallel of north latitude and extending to the foot-hills of the Rockies in southern Alberta. It is the most important tree in British Columbia and is second only to spruce as a source of lumber in the whole Dominion. It reaches its best development in the moist equable climate of the Coast, where it ordinarily attains a height of from 175 to 200 feet, and a diameter of from 3 to 6 feet and occasionally 250 feet in height and 10 feet in diameter, and frequently yields 50,000 to 100,000 board feet per acre. In the drier regions of the Interior plateau it does not grow to such large sizes nor are the stands so heavy.

The wood is light yellow to reddish in colour, with decided annual rings of summer-wood. Its chief characteristic is its strength; it is the strongest wood for its weight in America, and, though hard enough for flooring, is not difficult to work.

It is especially valuable for all forms of heavy construction where large sizes and strength are required, but it is also suitable for light construction, and its attractive grain and hard mar-resisting surface render it a very desirable wood for interior finish.

Douglas fir reproduces readily when the seeds can reach mineral soil and light is available, and it grows very rapidly under favourable conditions.

## HEMLOCK

There are three species of hemlock, two of which are commercially important.

**Eastern hemlock** (*Tsuga canadensis*) is found in the southern parts of Ontario and Quebec and throughout the Maritime Provinces. It is frequently associated with the tolerant hardwoods. The wood is of a coarse uneven texture, easily checked and apt to warp, but its strength and cheapness have led to its use for rough construction, railway ties, boxes and crates. It could be used for pulpwood.

**Western hemlock** (*Tsuga heterophylla*), which occurs throughout the Coast and Interior Wet belts in British Columbia, is a much superior tree. It attains a height of from 125 to 160 feet and a diameter of from 2 to 3 feet, rarely 5 feet. The wood is very light-coloured, usually a greyish white, and the grain is straight, and, though distinct, not so prominent as in Douglas fir. It is strong and does not split readily and is suitable for all but the heaviest construction. It takes a good finish and makes a very attractive interior finish. Appreciation of its value as lumber is increasing. Over 50 per cent of the pulpwood used in British Columbia is hemlock, and it makes excellent ground-wood or sulphite pulp.

## CEDAR

Two species of the genus *Thuja* occur in Canada. They are sometimes called "arbor-vitae."

**Western red cedar** (*Thuja plicata*) is found in regions of abundant precipitation in the Coast and Interior Wet Belts of British Columbia. It grows to such large sizes, frequently 150 feet high and 10 feet in diameter, that it is sometimes called the "giant cedar". It ranks second only to Douglas fir in commercial importance in British Columbia, and there is an abundant supply. The wood is light, soft and not strong, but owing to its resistance to decay and its freedom from warping, shrinking and checking, it is exceptionally durable when exposed to the weather. It is the principal wood used for roofing shingles in Canada and the United States. The colour varies from a light straw to dark reddish-brown and is very pleasing in interior woodwork. It is also used more than any other wood for telephone and telegraph poles and posts. Its lightness, durability, and straight grain make it valuable for small boats and canoes.

**Eastern cedar** (*Thuja occidentalis*) is a much smaller tree not often over 2 feet in diameter. It grows in moist situations from eastern Manitoba to the Atlantic coast. The wood is slightly harder than that of the western red cedar, but it has the same durable qualities which make it especially valuable for shingles, poles, posts, and boat-building. The supply is becoming seriously depleted.



## BALSAM FIR

This is a general common name given to all the species of *Abies*, the true firs, though the eastern species, *Abies balsamea*, is the one to which this name is usually applied.

**Balsam Fir** (*Abies balsamea*) is widely distributed in the Great Plains and Eastern regions. It is usually found associated with white or red spruce. Though inferior in quality, the wood is somewhat similar to spruce; though sawn into lumber to some extent, its principal use is as pulpwood. It is a quick-growing tree, but its value in the forest is decreased by its susceptibility to damage by insects and fungi.

**Lowland fir** (*Abies grandis*) occupies moist situations in the southern parts of the Coast and Interior Wet Belts in British Columbia. Under favourable conditions it grows rapidly, and may reach a height of 125 to 175 feet and a diameter of from 3 to 4 feet. The wood is white, light and soft and makes fair lumber and good pulp.

**Amabilis fir** (*Abies amabilis*) is confined to the Coast Belt, but it extends north to Alaska. In general characteristic of growth and wood it resembles lowland fir.

**Alpine fir** (*Abies lasiocarpa*), as the name implies, grows at higher altitudes throughout British Columbia. Though a small tree, seldom over two feet in diameter, it is valuable for pulpwood.

## LARCH

There are three species of larch in Canada, but one (*Larix Lyallii*) is a small alpine species.

**Western Larch** (*Larix occidentalis*) is confined to the southern interior portion of British Columbia in an intermediate zone between the Dry and Wet belts. It is usually found in a mixed stand with Douglas fir. It grows to a diameter of from 2 to 4 feet and a height of from 100 to 160 feet. The wood is heavy, hard, and strong with very distinct rings of summer-wood. It, is good wood for general construction or finish, and that it is not more abundant is to be regretted.

**Tamarack** (*Larix laricina*) is a smaller species found in poorly drained sites, usually associated with black spruce, from the foot-hills of the Rockies to the Atlantic coast and to the limit of tree growth in the north. The wood is heavy, hard, and strong and resists decay. It is much sought after for railway ties and is also used to some extent for lumber. During the last thirty or forty years, practically all the mature tamarack has been killed by the saw-fly, but many of the dead standing trees are still sound.

## YELLOW CYPRESS

**Yellow Cypress** (*Chamaecyparis nootkatensis*) is a British Columbia coast species, occurring at high altitudes in the south but descending to tide-water along the northern coast. The wood is bright sulphur in colour, even in texture, and is perhaps the heaviest and hardest coniferous wood in Canada. It is practically unaffected by changes in moisture, and is valuable as a cabinet wood and for woodwork on boats. The supply of yellow cypress is limited.

## BIRCH

There are seven species of birch in Canada which reach tree size, but the yellow, paper, and western species are the only ones of importance.

**Yellow Birch** (*Betula lutea*) is the most important hardwood in the Dominion from the standpoint of lumber production. It is found in commercial quantities in the Maritime Provinces and westward to the east side of lake Superior. It also occurs along the International Boundary from Fort William to the lake of the Woods. It is the largest of the native birches, reaching a height of 75 to 100 feet and a diameter of from 2 to 4 feet. It is a shade-enduring species and is therefore classed as a tolerant hardwood. The wood is hard, strong, and even in texture, taking a fine polish, and is used extensively for flooring, cabinet work, vehicle stock, handles, and furniture. Yellow birch also furnishes a considerable proportion of the wood used for fuel and distillation.

**Paper birch** (*Betula alba* var. *papyrifera*) is widely distributed, extending to the northern limit of the forests. It is a small tree, usually about 50 feet high and 8 to 10 inches in diameter. It is a short-lived tree, intolerant of shade, and reproduces prolifically on old burns. In pure stands or mixed with aspen, it forms a temporary type over large areas. The wood is inferior to yellow birch but is valued for turnery and fuel, and there is a possibility of its being used as pulpwood.

**Western birch** (*Betula occidentalis*), which is considered by some botanists as a variety of *Betula alba*, is found in British Columbia and is very similar to the paper birch.

## MAPLE

Nine species of maple occur in Canada, but four are dwarf species. They are all tolerant of shade.



**Sugar maple** (*Acer saccharum*), also known as hard maple, has the best wood and is also valuable as the source of maple sugar and syrup. Its range coincides with that of yellow birch, with which it is usually associated, extending from the Maritime Provinces to lake Superior and from Fort William to the lake of the Woods.

Mature trees are usually from 80 to 90 feet high and 2 to 3 feet in diameter, but sometimes larger. The wood is heavy, hard and even-grained and is used for flooring, furniture, agricultural implements, and interior woodwork. It is also one of the best woods for fuel and distillation.

**Red maple** (*Acer rubrum*) occurs throughout the same range as sugar maple but extends slightly farther north. The wood is softer and not of such good quality as sugar maple, but is used for the same purposes.

**Silver maple** (*Acer saccharinum*) is more limited in its distribution, being confined to the southern portions of Ontario, Quebec and New Brunswick. The wood of this species is also inferior to sugar maple.

**Broad-leaved maple** (*Acer macrophyllum*) occurs in moist bottomlands in the Coast Belt in British Columbia. It is not of much commercial importance but is used for ornamental planting.

**Manitoba maple** (*Acer Negundo*) is a native of the great Plains. It is a small tree with soft, coarse-grained wood of little value, but owing to its hardness and quick growth it is valuable for the planting of wind-breaks on the prairies.

### BASSWOOD

Only one species (*Tilia americana*) occurs in Canada. It is found throughout the Tolerant Hardwood belt in eastern Canada and in the southern portion of Manitoba. It is ordinarily 60 to 70 feet in height and 2 to 3 feet in diameter, with a long straight trunk. The wood is one of the most valuable in the Dominion. It is white, odorless, and tasteless and, though soft and light, is tough and strong. It is especially desirable for slack cooperage and boxes for food products, but it is also used for a great variety of purposes, such as furniture, vehicle bodies, interior finish, and veneer.

### ELM

There are three species of elm native to Canada.

**White elm** (*Ulmus americana*) has a wider distribution than any other tolerant hardwood extending from Saskatchewan to the Maritime Provinces. It attains considerable size, 50 to 125 feet in height and 2 to 7 feet in diameter. The wood is strong and tough, but not easily worked. It is used for cooperage, veneer, vehicle stock, and implements.

**Rock elm** (*Ulmus racemosa*) is found chiefly in southern Ontario. The wood is similar to white elm but is even tougher and stronger.

**Red elm** (*Ulmus fulva*) occurs in the southern portions of Ontario and Quebec. The wood is much inferior to other elms and is not extensively used.

### POPLAR

Of the seven indigenous species of poplar only three are of commercial importance.

**Aspen** (*Populus tremuloides*), though the most ubiquitous species in Canada, is as yet used only to a limited extent in the forest industries. The wood is light, soft, and tough, and, though sawn into lumber in some districts where other woods are scarce, it is difficult to season and is very perishable. In the Prairie Provinces it is a valuable fuel wood. It is often preferred to other woods for excelsior, cooperage and matches. There is the greatest opportunity for its utilization on a large scale in the manufacture of paper. It is a hardy, quick-growing but short-lived tree, and is seldom sound after it reaches 8 to 10 inches in diameter. It reproduces prolifically both by coppice and seed and quickly becomes established on burned-over lands. If conifers are present, however, its tenure of the soil is only temporary.

**Balsam poplar** (*Populus balsamifera*) has as wide a range as aspen, but is confined to rich moist sites such as the banks of rivers and bottomlands. It grows to larger sizes than aspen and the wood is similar.

**Black cottonwood** (*Populus trichocarpa*) is confined to the Pacific coast where it grows on moist alluvial soils along the valley bottoms. It is a large tree, 3 to 4 feet in diameter and 80 to 125 feet high, and the wood is light, soft, straight-grained, strong, tough, and odorless. It is used chiefly for veneer and boxes for food products, but could be used for pulp.

### ASH

There are 5 kinds of ash in Canada chiefly confined to eastern Canada, though green ash is native to Manitoba and Saskatchewan.

**White ash** (*Fraxinus americana*), the most important species, occurs in the southern portions of Ontario, Quebec and the Maritime Provinces. It is usually 50 to 60 feet in height and 2 to 3 feet in diameter with a tall straight trunk. The wood is hard, tough, and elastic, and is used for vehicles, cars, agricultural implements, tool-handles, skis, and to some extent for interior woodwork.



## BEECH

**Beech** (*Fagus grandifolia*) is a prominent species in the Tolerant Hardwood belt. It attains a diameter of from 2 to 3 feet and a height of 70 to 80 feet. The wood is hard and strong but difficult to season and work. It is used for flooring, furniture, vehicle stock, cooperage, handles, wood distillation, and fuel.

## OAK

There are 12 species of oak in Canada, most of them confined to the Southern Hardwood belt, but one species (*Quercus Garryana*) occurs in British Columbia. White oak (*Quercus alba*) is the most valuable, but the supply is very limited. The wood is hard and strong and has a beautiful grain when sawn radially, which makes it especially valuable for interior finish, cabinet work, and furniture.

**Red Oak** (*Quercus rubra*) is more widely distributed, and, though the wood is not so strong nor so attractive as white oak, it is used for the same purposes.

## 5—Ownership of Forests

Crown Lands, including timber lands, in Canada are administered in most cases by the provinces in which they are situated. In the three Prairie Provinces (Manitoba, Saskatchewan, and Alberta), in the Railway Belt (a strip twenty miles on each side of the Canadian Pacific Railway's main line through British Columbia) and in the Peace River Block in northern British Columbia the Crown Lands are administered by the Dominion Government. In this area there are few privately owned timber lands other than farmers' woodlots. Rights to cut timber are granted but the title of the land remains in the Crown. \*In Nova Scotia the greater part of the timber land has passed into private ownership. In New Brunswick over seven thousand square miles of forest land is owned outright by railway companies and other private concerns or individuals. \*In Quebec about six million acres have been so disposed of and in Ontario about five million acres. The policy of retaining the title to all timber lands has been largely followed in the Province of British Columbia in the area under provincial control as well as in the federal areas. About 1,387 square miles of timber land is in private ownership.

Information concerning the areas of forest in private ownership is difficult to obtain and the figures given in Table II are from estimates only. No attempt has been made to divide the areas owned by corporate bodies from those belonging to private individuals.

The ownership of forests by towns and communities, so common in Europe, is almost unknown in Canada, although efforts are being made to encourage the establishment and maintenance of forests of this nature.

The figure given for forests owned by the state and dedicated to timber production includes the areas of all forest reserves and those game reserves and parks in which the timber is protected and disposed of when mature.

In British Columbia all timber land west of the Coast range carrying more than 666 cubic feet (8,000 ft. board measure) per acre, and all lying east of this range and in the District of Atlin, carrying more than 416 cubic feet (5,000 feet board measure) per acre is called "Statutory Timber Land" and is withdrawn from disposal, until examined by the Forest Branch of the Department of Lands of the province. All land so examined and found suitable only for forest will ultimately be dedicated to timber production. All other lands in the province which are examined and found to be better suited for timber production than for agriculture will also be so dedicated whether they are classed as "Statutory Timber Land" or not.

This state of affairs in modified forms exists in almost all the provinces. New regions are being explored and their lands examined and in many cases where such land is found to be absolute forest land it is set aside in reserves. The policy of disposing of the title to lands fit only for the production of timber has been virtually abandoned in every province in Canada.

\*"History of Forestry", by B. E. Fernow.

TABLE II—CLASSIFICATION OF THE FOREST AREA BY OWNERSHIP

	Area belonging to					Total
	The State			Corporate bodies	Private ownership	
	Dedicated to timber production	Other forest	Total			
Sq. miles	1	2	3	4 and 5		6
Forest Reserves.....	223,007					
Parks.....	22,243					
	245,250	642,250	887,500	62,500		950,000
Percentage of Total Forest Area.....	25.82	67.60	93.42	6.58		100.00

Cols. 1, 4, 5 and 6.—Estimates based on available information.

Cols. 2 and 3.—Figures obtained by subtraction from total.

Cols. 4 and 5.—No division possible.



TABLE IIA—FOREST RESERVES AND PARKS

	Acres	Sq. Miles
British Columbia—		
Provincial Reserves.....	1,221,760	1,909
Dominion Reserves.....	1,713,804·8	2,677·82
Dominion Parks.....	1,043,840	1,631
Provincial Parks.....	940,160	1,469
Total.....	4,919,564·8	7,686·82
Alberta—		
Dominion Reserves.....	11,915,667·2	18,618·23
Dominion Parks.....	5,710,880	8,923·25
Total.....	17,626,547·2	27,541·48
Saskatchewan—		
Dominion Reserves.....	5,912,179·2	9,237·78
Manitoba—		
Dominion Reserves.....	2,500,025·6	3,906·29
Ontario—		
Provincial Reserves.....	11,754,240	18,366
Provincial Parks.....	2,847,360	4,449
Total.....	14,601,600	22,815
Quebec—		
Provincial Reserves.....	107,707,440	168,292·875
Provincial Parks.....	3,693,440	5,771
Total.....	111,400,880	174,063·875
Total of Dominion Reserves, as above.....	22,041,676·8	34,440·12
Total of Dominion Parks, as above.....	6,754,720	10,554·25
Total of Provincial Reserves, as above.....	120,683,440	188,567·875
Total of Provincial Parks, as above.....	7,480,960	11,689
Grand Total of Area dedicated to Timber Production.....	156,960,796·8	245,251·245

The following List of Forest Reserves and Parks, both Dominion and Provincial, shows the areas in detail in square miles.

DOMINION FOREST RESERVES AND PARKS

	Area Sq. miles	Total Square miles
In British Columbia—		
Yoho.....	127·35	
Glacier.....	106·00	
Larch Hills.....	22·37	
Mount Ida.....	43·70	
Fly Hill.....	219·50	
Martin Mountain.....	33·75	
Monte Hills.....	182·25	
Niskonlith.....	311·68	
Long Lake.....	262·34	
Tranquille.....	277·83	
Nicola.....	502·00	
Arrowstone.....	251·75	
Hat Creek.....	337·50	
		2,677·82
In Alberta—		
Cypress Hills No. 1.....	80·63	
Cooking Lake.....	60·50	
Rocky Mountain.....	13,454·04	
Lesser Slave.....	5,023·00	
		18,618·23
NOTE.—The Rocky Mountain Forest Reserve is divided for administrative purposes into five “forests” as follows: Crowsnest 1,304·15 sq. miles; Bow River 2,135·14 sq. miles; Clearwater 4,511·00 sq. miles; Brazeau 2,244·00 sq. miles; Athabaska 3,260·00 sq. miles.		
In Saskatchewan—		
Moose Mountain.....	153·35	
Beaver Hills.....	68·00	
Porcupine No. 2.....	2,869·75	
Pasquia.....	2,614·50	
Fort à la Corne.....	508·00	
Pines.....	161·05	
Nisbet.....	155·59	
Sturgeon.....	729·00	
Big River.....	1,342·00	
Seward.....	30·75	
Elbow.....	119·06	
Dundurn.....	62·75	
Keppel.....	66·75	
Manito.....	180·23	
Duck Mountain No. 2.....	81·60	
Cypress Hills No. 2.....	96·06	
		9,237·78
In Manitoba—		
Sandilands.....	187·75	
Turtle Mountain.....	109·27	
Spruce Woods.....	223·50	
Riding Mountain.....	1,148·75	
Duck Mountain No. 1.....	1,462·25	
Porcupine No. 1.....	774·75	
		3,906·29
Total of Dominion Forest Reserves.....		34,440·12



TABLE IIA—FOREST RESERVES AND PARKS—*continued.*

Dominion Parks		Total Square Miles	
<i>In Alberta—</i>			
Buffalo.....	158½	8,923·25	
Elk Island.....	51		
Jasper.....	4,400		
Nemiskam.....	8½		
Rocky Mountains.....	2,751		
Tar Sands.....	1,280		
Wawaskesy.....	54		
Waterton.....	220		
<i>In British Columbia—</i>			
Glacier.....	468	1,631·00	
Kootenay.....	587		
Revelstoke.....	100		
Yoho.....	476		
Total of Dominion Parks.....			10,554·25
Total of Dominion Forest Reserves and Parks.....			44,994·37

## PROVINCIAL FOREST RESERVES AND PARKS

<i>Quebec Forest Reserves</i>	Sq. miles	Total Square miles			
Saguenay and Labrador.....	110,000	168,292·875			
Péribonka.....	3,500				
Rimouski.....	1,237				
Chaudière.....	318½				
St. Francis.....	150				
Témiscouata.....	227				
Barachois.....	113				
St. Maurice.....	21,141				
Ottawa.....	27,712				
Rivière du Loup.....	500				
Bonaventure and Gaspé.....	1,733				
Laurentian.....	900½				
Rivière Ouelle.....	339				
Bungay, Chabot and Pohonegamook.....	252				
Beaubien-Bourdages.....	35				
Bellechasse.....	35				
Maskinongé.....	100				
Total of Quebec Forest Reserves.....					
<i>Quebec Parks</i>					
Gaspé Park.....	2,500			5,771	
Laurentide National Park.....	3,271				
Total of Quebec Provincial Parks.....					
Total of Quebec Forest Reserves and Parks.....			174,063·875		
<i>Ontario Forest Reserves</i>					
Nipigon.....	7,300	18,366			
Timagami.....	6,000				
Mississauga.....	4,896				
Eastern.....	100				
Sibley.....	70				
Total of Ontario Forest Reserves.....					
<i>Ontario Parks</i>					
Algonquin.....	2,741			4,449	
Quetico.....	1,700				
Rondeau.....	8				
Total of Ontario Provincial Parks.....					
Total of Ontario Forest Reserves and Parks.....			22,815		
<i>British Columbia Forest Reserves</i>					
Elk Lake.....	90	3,378			
Okanagan.....	805				
Aberdeen.....	112				
Grizzly.....	591				
Little White Mountain.....	311				
Total of British Columbia Forest Reserves.....					
<i>British Columbia Parks</i>					
Strathcona.....	829			1,469	
Mt. Robson.....	640				
Total of British Columbia Provincial Parks.....					
Total of British Columbia Reserves and Parks.....					
Total Provincial Forest Reserves and Parks.....			200,256·875		

## SUMMARY

	Sq. miles	Sq. miles
Dominion Forest Reserves.....	34,440·12	223,007·995
Provincial Forest Reserves.....	188,567·875	
Total Forest Reserves.....		223,007·995
Dominion National Parks.....	10,554·25	22,243·25
Provincial Parks.....	11,689	
Total Parks.....		22,243·25
Total for all Reserves and Parks.....		245,251·245



## 6—Relationship of the State to the Forest

### A—SUMMARY OF EXISTING LEGISLATION

#### DOMINION

A feature common to the timber administrations of the Dominion Government and that of the provinces of Ontario, Quebec, New Brunswick, and British Columbia is the system of timber licenses, whereby legislation prevents the permanent alienation of timber-land. The licenses are granted only for the right to cut timber, the title to the land remaining in the Crown. All licenses of the governments named contain what is known as the "Manufacturing Clause" whereby the export of unmanufactured timber cut on the lands covered by the license is prohibited.

An important piece of Dominion-wide legislation is compulsory patrol of railway lines throughout the Dominion for the prevention of the spreading of fires caused by locomotives and railway operation generally.

Dominion lands are administered by various Branches of the Department of the Interior as described in Section 7. The existing legislation in connection with forestry and the disposal of forest products is consequently scattered through a number of different Acts. The most important of these is the Forest Reserves and Parks Act. This Act, originally passed in 1906 and frequently amended, authorizes the setting aside from unoccupied lands of areas for Forest Reserves and Dominion Parks. It also authorizes the Regulation of such Reserves and Parks by the Governor General in Council. The objects of such reservations are declared to be the maintenance of the timber supply, the conservation of the minerals, game, and fish therein, the preservation of water supply, and the preservation of historic sites. No power is given to interfere with or to acquire rights already granted on lands which may be included in these reservations but in the case of timber-berths which have been cut over and given up by the licensee possession may be resumed and the land administered with the rest of the reserve or park. In the case of forest officers power of seizure and summary arrest is given in case of infractions of the Regulations.

These Regulations govern the use of fire for legitimate purposes, the disposal of timber by permit or sale, grazing, hay-cutting, fishing, hunting, mining, and the establishment of town-sites and summer resorts.

#### BRITISH COLUMBIA

By the Forest Act of 1912 and subsequent amendments the Forest Branch of the Department of Lands is given entire charge of the forests, its jurisdiction including all Crown revenue arising from woodlands, the conservation of existing forests, reforestation, forest fire protection, sales and tenancies of timber-lands, logging, lumber manufacture, and lumber market extension.

It has for many years been the policy of the Government to retain title to all forest lands and to dispose of the timber under cutting licenses. A considerable area was disposed of, however, under Crown grants to railways, etc., and this land is subject to taxes based on the assessed valuation.

Lands granted prior to 1887 are free of royalty unless the logs are exported in an unmanufactured state, in which case they are subject to a manufacturing tax. Those granted between 1887 and 1906 are subject to a royalty of 50 cents per 1,000 feet with the right to export without charge. From 1906 to 1914, royalty is charged and the right to export was not granted. Subsequent grants are subject to the regular royalty prescribed by the Timber Royalty Act, 1914.

Most of the alienated timber is held under annual licenses to cut, many of which can be renewed in perpetuity. A ground-rent is charged and royalty collected.

The present practice is to sell cutting rights by public competition for a stated period, the Government receiving, in addition to the ground-rent and royalty, the stumpage bonus bid by the purchaser.

The royalties vary with the class of wood cut, and are adjusted every five years on the basis of the average selling price of lumber.

A Forest Protection Fund is maintained by equal contributions from the timber owners and the Government and is administered by the Forest Branch.

A "close season" from May 1 to October 1 is established, during which permits for burning in forest areas must be obtained. Operators are required to maintain fire-fighting equipment in their camps, and provision is made for the compulsory destruction of debris which creates a fire hazard.

#### ONTARIO

The power of the Minister of Lands and Forests to dispose of timber on public lands is derived from The Crown Timber Act. This Act with the Regulations made thereunder is concerned with such matters as conditions governing disposal, cutting, scaling, collection, trespass, distress proceedings, manufacture, etc.

The sale of saw-timber is by tender after examination and public advertisement for 60 to 90 days of the terms and conditions applying to the particular sale. These contain, besides subjection to the usual regulations, clauses stating a definite removal period, stipulating the disposal of all slash about camps, dumps, along "tote" roads and railways and such other points as the Department may require, and requiring a cash deposit until cutting is completed to ensure fulfilment of contract.



The successful tenderer is the person who offers to pay the highest bonus per product unit above the set rates of Crown dues. These are, per thousand feet, board measure, \$2.50 for white, red, and jack pine, maple and oak, \$2.00 for spruce, basswood, and poplar, and \$1.50 for hemlock and tamarack. On square timbers the dues vary from 3 cents to 7½ cents per cubic foot; on pulpwood from 40 to 80 cents per cord of 100 cubic feet; on cordwood from 25 to 50 cents; on ties, 10 cents each; on poles, 25 cents to \$1.00, according to length. There is also a ground-rental charge of \$5.00 and a fire-tax charge of \$6.40 annually per square mile. These rates and charges are subject to change by Order-in-Council, but are always fixed for a definite period, 10 or, lately, 5 years, in order to give stability to the lumber business.

The license to cut is granted for one year only, with renewal of right if observance of regulations is satisfactory.

The sale of pulpwood areas is by individual agreements, good for 21 years. These agreements stipulate a minimum mill capacity, cost and number of persons employed, and miscellaneous conditions according to the area concerned.

The payment of Crown dues is based on measurement in the woods by government scalers, half of whose wages is collected from the licensee.

Since 1897 all softwood timber cut from Crown lands has been required to be manufactured in Canada and since 1900 the same restriction has been applied to pulpwood.

The Forest Reserves Act permits establishment of a reserve through proclamation by Order-in-Council. Its essential features are that settlement is prohibited, that no timber may be sold except fire-damaged or mature stands, and that provision exists for surrender to the Crown by the limit-holder of cut-over portions, subject to ratification by the Legislature.

The Provincial Parks Act is similar in its provisions, except that cutting rights may be granted by Order in Council.

The Forest Fires Prevention Act deals especially with the matter of forest-fire protection, and applies to all of the province except the southerly agricultural area.

It establishes a close season throughout the province from April 15 to September 30, during which fires may be set out for clearing land, disposal of debris, or for any industrial purpose, only under circumstances and subject to conditions prescribed by the regulations.

The act provides for the extension of the close season, use of permit system, regulation of engines and burners, prevention of the creation of fire hazards, etc. There is provision for the compulsory clearing up of any conditions, including slash from ordinary logging operations, which may be a fire menace. This applies also to private lands, and if not done by the owner may be carried out independently and the cost collected.

There is the customary provision for the organization of personnel, purchase of equipment, and carrying on of improvement work, to carry out the intent of the Act.

The Fires Extinguishment Act is a little-known Act meant mainly for application outside the provincial fire district. It provides that township and county councils may by by-law empower certain of their officials to compel the local people to fight woods fires.

The Reforestation Act is the basis for provincial reforestation activities. It provides for the acquirement of land for reforestation purposes, for the development of these lands, for obtaining the machinery and money necessary for the disposal of Crown lands for reforestation, and for entrance into agreements for reforesting lands held by other persons.

The Counties Reforestation Act enables municipalities by by-law to acquire land for reforestation purposes, manage and develop plantations, and enter into agreements for their development. A limit of \$25,000 debenture issue for land is fixed.

#### QUEBEC

The laws respecting lands and forests and the timber regulations from the Revised Statutes of Quebec, 1909, and Act 1 Geo. V. with amendments issued in 1916 place the administration of the forests under the Forest Service of the Department of Lands and Forests. This includes the classification of the land, disposal of timber, regulation of cutting operations, measurement of timber cut, collection of revenue, protection of the forest, tree planting and all other matters pertaining to the forests. Certain areas are definitely set aside as Parks and the setting aside of Forest Reserves by Order in Council is authorized.

Licenses to cut timber are disposed of by public competition to the bidder of the highest bonus in addition to the ground-rent and royalty on timber cut. Licenses are renewable from year to year, but the rate of royalty may be changed by the Government at any time. The exportation of unmanufactured wood from Crown lands is prohibited. The timber cut is measured by licensed scalers, and operators are required to make returns of the amounts. Diameter limits are fixed, but modifications are allowed when working plans acceptable to the Forest Service show that such are necessary for the best silvicultural practice. Logging operations are inspected by the Forest Engineers of the Service and when deemed advisable the amount to be cut is prescribed. Every licensee is required between May 1st and September 30th to have his limits patrolled by competent fire rangers, paid and selected by him but appointed by the Minister of Lands and Forests, and the latter may prescribe the number of fire rangers to be employed. He may also require patrol at other times if conditions demand it. Some of the licensees maintain separate patrols, but for the most part they have formed associations and conduct their protection operations on a co-operative basis. The Forest Service gives grants towards these associations and also maintains fire protection on unlicensed lands outside of the associations districts.

A close season is established between April 1 and November 15, during which permits must be secured from the rangers for the setting of fires for the purpose of clearing land. In 1922 legislation was passed requiring all persons who wish to go into or sojourn or travel in the forest between April 1 and November 15 to secure a permit issued by the Department of Lands and Forests.



## FORESTS OF CANADA

## NEW BRUNSWICK

The Forest Act of 1918 establishes a Forest Service under the Minister of Lands and Forests. The duty of the Forest Service is to "administer all statutes, rules, and regulations respecting forestry, hunting and fishing, forest and game protection" and to take charge of the protection of forests from fire, permanent improvements on Crown forests, and reforestation. It is aided by a Forest Advisory Board and a permanent forest-protective fund is established. The Forest Act provides for a "close season" for fires and includes regulations governing forest fires. The Lieutenant Governor in Council has power to revise the regulations and the rate of stumpage from time to time. The export of pulpwood cut on Crown lands is prohibited and all pulpwood cut on these lands must be manufactured within the province.

## NOVA SCOTIA

The greater part of the timber lands of this province have passed into private ownership, but under the present Crown Land Act the title to Crown Lands is granted only in the case of agricultural land. Leases of timber land are granted for a term of twenty years, the title remaining in the Crown, a rental charge being fixed by the actual value of the land as reported by the Provincial Land Surveyor, but in no case is the rental to be less than \$1.00 per acre.

The Forest Protection Act (1913) provides for a system of fire protection described later. (See "Nova Scotia" under subsection B of this Section). The rangers appointed under the Act have power to institute prosecutions against those who violate the provisions of the Act.

## B—SUMMARY OF ADMINISTRATIVE METHODS

## DOMINION

Forests on Dominion Lands are administered with the object of maintaining a permanent supply of timber. In the case of Forest Reserves they are primarily intended to supply the surrounding settlements with timber for local use and to protect the watersheds. Permits are issued to bona fide settlers for their necessary supplies of firewood, fencing material, and timber for building construction. Permits to operators of portable saw-mills are granted in order to provide a means of having the timber so granted under settlers' permits sawn into lumber for the sole use of the settlers. Larger quantities (than those granted under permit) of fire-killed or mature timber are disposed of by timber sales, whereby a mill may be established and the timber sawn and sold on the open market, or whereby the firewood, mine timbers, railway ties, or other forest products may be cut and marketed.

In administering these sales the Forestry Branch keeps always in view the object of perpetuating the supply. Only such trees as are marked or designated for removal by the forest officer may be cut and all material so designated must be cut and removed from the sale area by the date of the expiration of the final permit. The sale areas are examined by qualified forest officers, the timber thereon estimated, and the area mapped. The right to cut the timber is then disposed of by tender or auction following public advertisement.

The time given to remove the timber varies with each sale, depending on the quantity of timber, and is definitely fixed in each case.

The disposal of all debris resulting from operations is insisted on, by lopping, piling, and burning under the direction and to the satisfaction of the forest officer placed in charge of each operation.

Damage to existing forest growth and reproduction is forbidden and the regulations concerning forest fires are rigidly enforced, the operator being held responsible for all fires on the sale area.

The method of disposing of timber by these permits and sales is such that regeneration of the natural forest is provided for as well as can be done without actual replanting. Where necessary planting will no doubt be resorted to and several experimental plantings on waste areas and cut-over areas have been made. Fire-protection methods are described in Section 7.

On lands not included in Forest Reserves, annual renewable licenses to cut timber are granted for stated areas, an annual rental and royalty on the timber cut being collected. These licenses, or "berths", are disposed of by public competition to the one offering the largest lump sum or stumpage bonus. Regulations provide for cutting to a diameter limit and the disposal of logging debris.

## BRITISH COLUMBIA

The main efforts of the Forest Branch have been directed towards the protection of the forests from fire and the business administration of the forests. The Province has been divided into districts, each in charge of a District Forester, under whom a large staff of permanent and temporary rangers are employed for fire protection. In connection with the administration of the forests, large areas have been covered by reconnaissance surveys, and detailed examination made of areas to be offered for sale. The inspection of logging operations and measurement of timber cut are also functions of the Forest Branch.

## ONTARIO

The first Fire Act of the province, passed in 1878, remained a dead letter till 1885, when a patrol system was inaugurated. The existing systematic fire-patrol organization throughout the province dates from 1917.



The features of the protective system are:—

(1) Close season for fires, requiring official permit for land clearing and industrial operation. The permit area varies with conditions, and at present comprises all of northern Ontario.

(2) Patrol by motor boats, motor railway cars, motor trucks, railway velocipedes, horses, canoes and bicycles, and on foot;

(3) Extensive use of portable forest-fire pumps;

(4) Clearing of land and burning slash and debris around northern towns, along railways and other hazardous points;

(5) Erection of lookout towers, telephone lines and ranger cabins and construction of trails and roads;

(6) Inspection of fire-protective appliances on locomotives by men travelling from round-house to roundhouse;

(7) Patrol by air-craft over a considerable portion of the province for the purposes of detection and directing the fight against large fires;

(8) Co-operation with the Fire Inspection Department of the Dominion Board of Railway Commissioners permitting superior provincial officials to become officers of the Board (without pay) and as such to enforce the orders of the Board and the provisions of the Dominion Railway Act;

(9) Publicity work. Warning posters are displayed everywhere along canoe routes and other routes of travel. Calendars, rulers, pencils, whetstones, etc., bearing fire warnings, are distributed. For three seasons large illustrated serial advertisements have been published simultaneously in all the newspapers of the province during the peak of the fire period. It is recognized that the protection problem can only be solved by the co-operation of all.

A provincial forest station of 1,800 acres was established at St. Williams, Norfolk county, in the southern hardwoods region, in 1909. It was only nicely under way when the war halted things, so that an output for general planting on any large scale is only now beginning to be available. The nursery portion of this station comprises about 100 acres. In 1922, two new stations were established, one of 150 acres at Orono in Durham county, and the other of 1,000 acres at Midhurst in Simcoe county. At present there are about 9 million transplants, most of which will be ready for planting out in 1924, and over 1,000 seed-beds which are expected to produce 12 million seedlings. An annual average collection of about 1,000 pounds of seed is made for nursery sowing.

On the St. Williams property plantations have been made totalling 225 acres, and under-planting to the extent of 300 acres. This work has been done from time to time on waste sand areas as surplus stock was available after free distribution to the public was met. The principal species used are white, red, jack and Scotch pines, white and Norway spruce, and European larch.

At the Sand Banks in Prince Edward county the province has purchased 700 acres of drifting sand, long a menace to surrounding farms. Here 150 acres were planted up in 1922, and another 150 acres in 1923.

There are also numerous township and county projects, in which the Department has directly carried out the planting.

#### QUEBEC

So far, administrative forestry has been mainly developed along the line of fire protection. Special efforts have been made toward ensuring a more conservative utilization of the exploited timber and reducing waste in the course of lumber operations. Though, as stated in the preceding chapter, a special regulation provides for the cutting of timber to a specified diameter, there has been a tendency toward surveying the timber-lands where lumbering operations were to be carried on, in order to lower this diameter limit, when it was thought to be advantageous from a silvicultural point of view.

The fire-protection system since 1913 is well developed. Timber-limit holders (lessees) have formed associations in different districts for the purpose of securing an adequate protection against forest fires. Such associations have their own staffs for the patrol of their forest during the dangerous seasons. They act in co-operation with the Board of Railway Commissioners and with the Provincial Government. The latter contributes to this system in the way of money grants, and, moreover, pays for the patrol of the vacant Crown lands which are located within the area of the association's activity. When such associations do not exist, the patrol is entirely under the charge of the Government.

The fire-protection system has been improved by the following measures:—

1. The extension of telephone lines throughout the forest;
2. The organization of a patrol by boats and railway speeders;
3. The establishment of a close season from 31st March to 16th November;
4. The construction of trails through the forests;
5. The installation of lookouts;
6. The adoption of a special law providing for the issue of permits for burning, of a law urging the limit-holders to protect their forest against fire, and of legislation providing for the issue of travel permits between the 1st of April and the 8th of November;
7. By a press campaign in co-operation with the Canadian Forestry Association and *La Vie forestière et rurale*;
8. By the establishment at Roberval of a hydroplane station in 1920.



## NEW BRUNSWICK

The Government of the Province at the present time is confining its attention to developing more efficient means of forest protection, awaiting the completion of the forest survey which is being carried on by the Forest Service.

Provision in the Act of 1913 was made for a complete stock-taking of forest resources and a classification of lands. Starting in 1916 this survey has covered to date approximately 60 per cent of the Crown Lands.

The Act of 1918 provides for the cleaning up of debris in connection with lumbering operations and insists on other protective measures. It authorizes the construction of improvements such as trails, telephone lines, and lookout stations.

A permanent staff of rangers under the supervision of the Chief Forester carries out the patrol for fire and game protection. The rangers travel by canoe and road as in the other eastern provinces.

No provincial reforestation has been begun up to the present time, but provision is made in the Forest Act for this work, and a nursery is to be established this year.

The cutting regulations have been drawn up so as to protect and encourage the young growth remaining after cutting operations. A combination of selection with a diameter limit for all species is followed.

## NOVA SCOTIA

The Commissioner of Forests and Game under the Attorney General of the province is responsible for the protection of forests from fire. Each municipality on the mainland (excluding Cape Breton island) appoints a Chief Forest Ranger whose duties are to travel periodically over all woodlands in the municipality, whether of Crown or private ownership, to prevent the starting or spreading of fires, to trace the origin of all fires discovered, and to report direct to the Commissioner. These Chief Rangers have the power to appoint assistant temporary rangers whenever necessary. There is no provincial planting done and the regeneration is assisted only by fire protection.

## C.—SUMMARY OF ASSISTANCE GIVEN FORESTRY

## DOMINION

The Dominion Government provides for the distribution of tree-planting material, and furnishes expert advice as described under Section 7.

An annual grant is made to the Canadian Forestry Association, but no opportunity exists for the remission of taxation as an encouragement to forestry.

## BRITISH COLUMBIA

The present rate of taxation of timber lands is generally speaking 3 per cent on a moderate assessment. The system of taxation is now under investigation. Owing to the shortage of trained personnel, assistance to private holders of timber-land has not been possible apart from dealing with general enquiries. Silvicultural studies on pulpwood holding are made at the request of the holders for the purpose of determining the yield for sustained operation. No provision is made for nursery stock or replanting in this province.

## ONTARIO

The Department provides assistance by providing free nursery stock to individuals, planting up municipally owned demonstration forests; co-operating in definite reforestation projects, examination of private woodlots, giving expert advice, inspection of plantations, and by grants to societies.

Since 1904 the Department has distributed nursery stock free to applicants except for carriage charges. The yearly calls have averaged around 250,000 trees, and this season totalled 1,000,000 trees. The purpose is mainly educational.

The establishment of demonstration forests began in 1921, there being now 17 such municipal plantations ranging in size from 3 acres to 75 acres. They embrace plantations belonging to 13 townships and 2 villages in 11 counties. The municipality purchases the land, which is planted up for them free of charge, and its further care is in their hands.

Old Ontario has relatively large areas of waste sandy soil located through the farming section proper. These have been alienated from the Crown in early days and comprise at least 200,000 acres.

The Counties Reforestation Act provides machinery by which such areas may be purchased locally and utilized definitely for growing timber supplies. The county purchases at least 1,000 acres in one block and enters into agreement with the Department for its development. The Department undertakes to reforest the property, look after its further management, and to turn it over to the county at any time, on payment of the expenditure incurred.

So far but one county has a project actually being carried out, although several others have negotiations under way. On the Simcoe county property there have been 300 acres planted to date.

The Exemption of Woodlands Act permits any municipality by by-law to exempt woodlands in whole or in part from municipal taxation. It is seldom that advantage is taken of it.

Private woodlands and plantations are examined on application, and silvicultural treatment outlined, including pathological conditions.

An annual grant is made by the Legislature to the Canadian Forestry Association.



## QUEBEC

A Forest Nursery, established since 1908, serves as a demonstration station for the School of Surveying and Forestry and also for the Forest-Ranger School. It provides planting material for distribution and sale to private owners of forest lands, to educational bodies, towns, etc. It also enables the Government to make some objective plantations, such as the reclamation of shifting sands. The collection of tree seed has been started and will be continued. The capacity of the nursery has been raised to 5 million trees, as the demand for both ornamental and forest trees is developing quickly. Unfortunately the danger of forest fires in the past has been such that it has been found more reasonable to protect the natural forests than to risk plantations in exposed places.

The Berthierville Nursery, in 1922, shipped 579,883 trees of various species, comprising conifers of a few inches in height and ornamental trees of 15 and 20 feet. Through arrangements made by the Minister of Lands and Forests with his colleague of the Roads Department, 5,000 trees were set by the forest engineers along the Quebec-Montreal highway. Small nurseries have also been established in seven localities to supply trees on other highways and provision is made for attending to trees along public roads.

Expert advice is given by members of the staff on forestry problems that are submitted to the department, and an annual grant is made to the Canadian Forestry Association.

The School of Forestry and Surveying at Laval university in the city of Quebec was established by the Provincial Government. It is supported by the province and many of its lecturers are members of the Forest Service.

Provision is made by legislation for the creation of township communal forests, and settlers and others are encouraged and assisted to devote a part of their holdings to timber production. For each acre of land planted with forest trees the owner is entitled to a land order good for twelve dollars on the purchase of public lands.

## NEW BRUNSWICK

Provision is being made for the distribution of nursery stock in this province. Expert advice to timber holders is available from the Forest Service. The province makes an annual grant to the Canadian Forestry Association. It has given financial assistance to the Dominion Bureau of Plant Pathology for the investigation of tree diseases and to the Dominion Entomological Branch for the balsam (spruce) bud-worm investigation.

Remission of taxation and other encouragement to private enterprise in reforestation is under consideration.

## NOVA SCOTIA

In this province there is no assistance given to forestry by provision of nursery stock, expert advice, grants to societies or remission of taxation.

## 7.—Forest Authorities

## DOMINION

The Dominion Government at Ottawa administers Crown lands in the Provinces of Manitoba, Saskatchewan, and Alberta and in three areas in British Columbia. Under the terms of the Union in 1871, the Province of British Columbia ceded to the Dominion Government, as its contribution toward the construction of the Canadian Pacific railway, a strip of territory extending twenty miles on each side of the main line of the railway from the Alberta boundary to the head of Burrard inlet on the Pacific coast. This is known as the "Railway Belt." In it certain lands had already been alienated by the Province, and in lieu of these a further area of 3,500,000 acres in the Peace River district was also ceded to the Dominion Government. Certain coal-bearing lands in the Crowsnest pass in the southeastern part of the province are also under federal administration, making a total of 14,494,000 acres of Dominion Lands in British Columbia.

The timber-lands on Dominion lands are administered by three different branches of the Department of the Interior of the Federal Government. The Forestry Branch is chiefly concerned with forest reserves and fire protection, the Timber and Grazing Branch deals with timber berths, and the Dominion Parks Branch administers the Dominion Parks which are primarily national playgrounds. The Board of Railway Commissioners for Canada has charge of the fire protection along lines subject to its jurisdiction. These different authorities will be described separately.

## FORESTRY BRANCH

The Forestry Branch has its head office in Ottawa under the Director of Forestry. The staff at Head Office consists of technical foresters and the necessary clerical and stenographic personnel.

The work of the Branch includes Administration of Forest Reserves, Fire Protection, Forest Resources and Statistical Investigations, Forest Surveys, Tree Planting, Forest Products Research, and Silvicultural Research.

*Forest Reserves.*—The administration of forest reserves is carried on in the field under three Inspectorates, namely, the Manitoba Inspection District, with a District Forest Inspector at Winnipeg; the Saskatchewan District, with an Inspector at Prince Albert; and the Alberta and British Columbia district, with an Inspector at Calgary. Each District Forest Inspector has an Assistant Forest Inspector and an office staff at his District headquarters. Each important



forest reserve, or group of reserves, in the District has a Forest Supervisor and a Forest Assistant and, where necessary, an office staff. Student assistants are employed during their summer vacations to assist in the reserves administration. Forest Rangers in Charge administer the affairs of the smaller reserves.

Each reserve has a staff of permanent Forest Rangers, each in charge of an administrative district, assisted during the fire season by Assistant Forest Rangers on patrol duty.

The Forest-Reserve staffs are engaged in protecting the timber and forest growth from fire, trespass and other damage. They administer timber sales and dispose of timber by permits. They grant permits for grazing privileges and other miscellaneous uses of the reserve. They construct roads, trails, lookout stations, telephone lines, and other improvements which are an aid in protective and administrative work. Some forest planting is done by the reserve staffs which will be described in connection with the Tree-Planting Division.

*Fire Protection.*—The protection of forests within the reserves and in their immediate vicinity is carried on by the Reserve Staffs as described. For areas on Dominion lands outside forest reserves a special staff has been organized under the Inspector in each District.

The protection of forests from fires along railway lines on Dominion Lands is carried on by a staff of Railway Fire Guardians, under the District Inspectors, who are officers of the Railway Commission, in co-operation with the Railway Fire Rangers employed by the various railway companies.

*Forest Resources and Statistical Investigations.*—The investigation of the forest resources of the Dominion, formerly conducted by the Commission of Conservation, is now being carried on by the Forestry Branch. A comprehensive survey of the forest resources of Ontario, conducted in co-operation with the Department of Lands and Forests of Ontario, is nearing completion. All available information concerning extent and nature of the forests in Canada is collected and revised from time to time. In co-operation with the Bureau of Statistics, information is collected and compiled concerning the forest products and wood-using industries. Trade statistics relating to forest products are compiled from data published by the Department of Trade and Commerce. This work is under the Forest Resources Specialist with one technical assistant and the necessary clerical staff.

*Forest Surveys.*—Seasonal parties under technical foresters, assisted by student assistants and the necessary packers, canoe-men, axe-men, etc., are organized to conduct surveys on Dominion Lands. Reconnaissance surveys are made for the purpose of securing general information as to the extent and character of the forest, and the classification of the land as to its agricultural or forest value. Detailed surveys are also made to determine the amount of timber on areas for which there is a market for the timber.

*Silvicultural Research.*—Studies of the silvicultural characteristics of various species, rate of growth, and the best practicable means of securing sustained production of the most valuable species are being conducted at the Forest Experiment Station at Petawawa, and at numerous points throughout the Dominion in co-operation with the various Provincial Governments and private companies. Accurate methods of measuring standing timber and of preparing volume tables are being developed. Forest research is under a special technical officer, assisted by five foresters, field assistants and office staff.

*Expert Advice.*—The Forestry Branch maintains at Head Office a technical Forester, who is available to farmers and woodlot owners throughout Canada, for the giving of expert advice on the care of woodlots and planting projects. His services are free with the exception of travelling expenses.

*Tree-planting Division.*—The Chief of the Tree-planting Division, with headquarters at Indian Head, Saskatchewan, has charge of the growing of plant material and its distribution to farmers and ranchers in the three Prairie Provinces. The larger nursery at Indian Head is under his direct supervision. A second nursery at Sutherland, Saskatchewan, on the outskirts of the city of Saskatoon, has been established to supply the northern part of the provinces. It is in charge of a Superintendent. The staff of the Division consists of the Chief, the Superintendent, eight or more Tree-planting Promoters, and the necessary office staff for the headquarters at Indian Head.

Tree species suitable for prairie planting are grown at the nurseries and distributed free in the form of seedling, cutting, and young transplants. Applicants are required to prepare their land according to the directions given by the Tree-planting Promoters. The Tree-planting Promoters inspect the proposed site of the plantation and pass on the application. If the conditions are fulfilled, the material and the instructions are given free, except for the transportation charges, for the planting of woodlots for fuel and fencing, and wind-breaks for the protection of buildings, stock and gardens. The farmers agree to plant and care for the trees according to instructions, to cultivate the plantations until established, and not to remove the trees without permission. The plantations are inspected annually by the Tree-planting Promoters until established. From five to six million seedlings and transplants are distributed annually in this way.

*Forest Planting.*—Certain experimental plantings have been made on reserves by the reserve staff under the direction of the Chief of the Tree-planting Division, and under the direct supervision of one of the Head-Office technical foresters. Altogether 200 acres have been replanted since 1914.

*Forest Products Laboratories.*—The Forestry Branch maintains a bureau of information and research into the value and utilization of Canadian forest products. This institution is engaged in investigation into the physical and chemical properties of the various species of wood and their utility for industrial use. Investigations of the decay of wood and methods of prevention are also conducted.



The work of timber testing is conducted at the Laboratories in Montreal, in co-operation with McGill University. A branch testing Laboratory has also been established in co-operation with the University of British Columbia at Vancouver.

The work of these Laboratories is under the direction of the Superintendent at Montreal, and is divided into Timber Testing, Timber Physics, Pathology, Wood Preservation, and Pulp and Paper. Each Division is normally in charge of a technical Divisional Chief with technical and other assistants. There is the usual staff of clerks and stenographers.

The Laboratories in Vancouver are under a Superintendent with technical and non-technical assistants.

*Income and Expenditure.*—During the last two years the expenditure of the Forestry Branch has averaged \$1,000,000 and the income \$145,000. The expenditures are divided as follows:—Head Office, \$50,000; Forest Reserves, \$480,000; Fire Protection on Crown Lands outside of Forest Reserves, \$260,000; Tree Planting, \$70,000; Forest Products Laboratories, \$85,000; Surveys and Research, \$55,000.

*Recruitment and Training.*—All vacancies in the Civil Service, including those in the Forestry Branch, are filled under the direction of the Civil Service Commission. In the majority of cases, especially in connection with the administrative and technical personnel, the vacancies are advertised publicly by the Commissioners. Applications, giving full details, are sent in by the applicants and at stated times and places competitive examinations, partly oral and partly written, are held. The final appointments are made by the Civil Service Commission. In certain cases the applicants are required to be residents of the province in which the vacancy occurs. Returned soldiers are given preference in making all appointments and promotions.

Technical foresters are required to have graduated from a recognized university course in Forestry or to have had equivalent training and experience. The qualifications for each position are described in the advertisements and vary, of course, in each case. A permanent non-technical field employee is required to have had experience in the bush on work connected with forestry or some forest industry, to have good physique, and a sufficient knowledge of reading, writing, and arithmetic for the carrying on of the ordinary administrative work on a reserve. This class of employees is made up of Forest Rangers, Fire Rangers, Construction Foremen and Grazing Assistants. In some cases the vacancies in this class are advertised and filled after competitive examinations, but in most cases they are filled by the Civil Service Commission on the recommendation of the District Forest Inspector after he has had personal interviews with the applicants. Temporary employees for fire patrol, improvement work, and other labour are recommended for appointment for periods not exceeding seven months.

Technical men are largely recruited from the Forestry Colleges. Undergraduates are given employment as Student Assistants on surveys or forest reserves during their summer vacations and are given an opportunity to compete for permanent positions on graduation.

*Publications and Reports.*—The Director of Forestry publishes an Annual Report which contains summaries of the reports of the officers in charge of the different divisions of the work of the Branch. This report is first published in the Annual Report of the Department of the Interior, and later issued separately.

Other publications of the Branch are technical and statistical in nature. Technical bulletins include printed reports on the results of research work at the Forest Products Laboratories, reports of certain important forest surveys, studies of silvicultural conditions on certain reserves, tree distribution, tree-planting and care of woodlots, and game preservation. The statistical bulletins cover studies of wood-using industries and forest-fire statistics.

From 1908 to 1917 the Forestry Branch published annual reports covering the production of lumber, lath, shingles, and cooperage stock, and the consumption of pulpwood, railway ties, poles, mining timber, and tan-bark. The collection of these forest-products statistics is now carried on by the Bureau of Statistics of the Department of Trade and Commerce, which co-operates with the Forestry Branch in the compilation and publication of the information gathered. A series of studies of the secondary wood-using industries was made by the Forestry Branch since 1911 and is being continued in co-operation with the Bureau of Statistics in such a manner that each region will be covered once every five years by a printed report.

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*The Commission of Conservation*, which was included as a forest authority in the report to the Empire Forestry Conference in 1920, was abolished by Parliament in 1921, and the forestry work of the Commission and several of the technical members of the staff, engaged thereon, were transferred to the Forestry Branch.

#### TIMBER AND GRAZING LANDS BRANCH

This Branch of the Department of the Interior administers the timber, grazing, and hay-cutting on Dominion Lands outside of forest reserves. It also administers these matters on lands within forest reserves for which licenses or permits were granted prior to the establishment of the reserves.

The Branch is organized under a Controller at the head office at Ottawa. For the general administration of Dominion lands, the territory has been divided into seven districts, in each of which there is a Dominion Lands Agent. At Winnipeg and at New Westminster, there are special Crown Timber Agents, who are directly under this Branch, but at the other agencies the Land Agents act as Crown Timber Agents. The Superintendent of Dominion Timber



Agencies, whose headquarters are at Winnipeg, supervises the work of the Crown Timber Agencies. Timber Inspectors attached to the local agencies inspect the timber operations within their districts, and Appraisers of Grazing Lands conduct the field investigations in connection with grazing and hay-cutting.

Timber on Crown lands is disposed of by this Branch under licensed berths, which are granted by public competition, and by permits to settlers and others, without competition, for small amounts of saw-material, poles, posts, fuel, etc.

Owing to the fact that the duties of the officers of this Branch are involved with those of other Branches, it is impossible to segregate the expenditure of this Branch. The revenue collected by the Branch in 1922 was approximately \$886,000, of which \$717,000 was secured from timber in the form of bonuses, royalty, rental, and permit fees, and the balance from grazing and hay permits.

The staff of this Branch is recruited under the Civil Service Commission, as in the Forestry Branch. The Timber and Grazing Lands Branch does not employ any technically trained foresters.

#### NATIONAL PARKS BRANCH

The National Parks of Canada cover an area of about 10,000 square miles. They are chiefly located in the Rocky mountains. All the natural resources are conserved within these areas. Wild animals, fish, birds, and flora are protected by parks regulations, and timber and minerals cannot be operated except under license and regulation. The administration is under the Commissioner of National Parks, at Ottawa, with a superintendent in charge in each park. All construction, maintenance, and fire protection are carried on under these officers. The average appropriation for the past three years in the National parks was \$1,088,660, with an average expenditure, for the past three years, on roads of about \$985,000, on trails about \$44,000, and for fire protection about \$59,000. There are 377 miles of roads, 1,868 miles of trails and 522½ miles of telephone lines in operation. The protection of the forest and wild life is carried out by the competent warden staff, with efficient equipment.

#### BOARD OF RAILWAY COMMISSIONERS

*Fire Inspection Department.*—With nearly forty thousand miles of steam railways within the Dominion, Canada has a larger per capita mileage than any other country in the world. Of this mileage, 97 per cent is subject to the jurisdiction of the Board of Railway Commissioners, since the recent amalgamation of the Canadian Government Railways with the balance of the Canadian National Railways System. Previous to 1923, these lines, embracing some 4,690 miles, were not under the Board's jurisdiction.

Slightly over half the entire railway mileage of the Dominion is included in the Canadian National Railways System. The combined mileage of the two great systems, that is, the Canadian National and the Canadian Pacific, constitutes 90.4 per cent of the total mileage of the country. Miscellaneous smaller lines, subject to the Board's jurisdiction, account for 6.6 per cent of the total.

Lines not subject to the Board's jurisdiction, aggregating 1,166.85 miles, or 3 per cent of the total, include those holding provincial charters, as well as the lines owned and operated by provincial governments. Examples of the latter are the Timiskaming and Northern Ontario railway, in Ontario, and the Pacific Great Eastern railway in British Columbia. On these two railways, fire protection is provided by the Provincial forest services concerned. Provincially chartered railways in private ownership are subject to the fire legislation of the several provinces.

On the remaining 97 per cent of the railway mileage, the measures to be taken by the companies for the prevention and control of fires due to railway agencies are prescribed by the Board of Railway Commissioners. The Board's requirements in this respect are, briefly, as follows:—

(a) Railway rights of way must be maintained free from all unnecessary combustible matter. Cuttings, dry grass, and other inflammable debris are generally burned early in the spring or late in the fall. The time when fire may be used for this purpose is regulated by local officers of the Fire Inspection Department of the Board, by the issuance of permits to burn. Such local officers may prohibit all burning operations when weather conditions render the use of fire unsafe. Ordinarily, railway rights of way are 100 feet in width, that is, 50 feet on each side of the centre of the main track. On a comparatively small mileage, the right of way is double this width. Steady progress is being made towards better conditions on rights of way through forest sections. On some of the newer lines, owing to the heavy cost, considerable work still remains to be done. The effectiveness of this work is greatly reduced by the presence of logging slash and other inflammable debris on lands immediately adjoining rights of way. This constitutes a very serious problem in the control of fires originating on or near the railways. A small beginning toward the solution of this problem on outside lands has been accomplished.

(b) Efficient spark-arresters and other fire-protective appliances must be maintained on all coal-burning locomotives. Railways are required to make weekly inspections of such appliances and to hold defective locomotives out of service until repairs have been made. Intensive check inspections of fire-protective appliances are made by the Board's inspectors.

(c) The dumping of fire, live coals, and ashes upon the right of way is prohibited unless these are immediately extinguished.

(d) The use of dangerous classes of locomotive fuel is prohibited, unless locomotives are equipped with special spark-arresting devices approved by the Board.



(e) To reduce the danger of fires being set along the railway, by burning smoking-materials thrown by passengers from trains, railways are required to post warning notices in cars where smoking is permitted, and trainmen issue verbal warnings to passengers in addition.

(f) The dangers of fires in prairie sections of the Prairie Provinces is greatly reduced by the ploughing of fire guards along railway lines in accordance with requirements prescribed by the Chief Fire Inspector of the Board.

(g) The Chief Fire Inspector is authorized to prescribe the establishment of special fire patrols by railway companies through forest sections.

(h) Railway companies are required to instruct section men, agents, contractors, train men, and other regular employees relative to the reporting and extinguishing of fires occurring within 300 feet of the track, unless proof shall be furnished that such fires were not caused by the railways.

(i) Each railway company is required to submit a report to the Board with respect to every fire which burns over more than 100 square feet outside the right of way in what is classified as a forest section. These reports are checked and supplemented by reports from officers of the Fire Inspection Department.

The fire-protection work of the railway companies is supervised by the field staff of the Fire Inspection Department of the Board. This staff is not a special set of men employed by the Board, but is made up of employees of the various forestry and fire-protective organizations of the Dominion and Provincial Governments, such employees being appointed officers of the Board under a co-operative arrangement established immediately after the issuance of the Board's fire regulations in 1912. This plan has for the most part worked out admirably during the 12 sessions it has been in effect. The railway companies have, with few exceptions, co-operated efficiently, and the fire loss due to railway causes has decreased to such an extent that the railways have now become minor, instead of major, agencies in causing loss by forest fires. In many cases, the railways have been effective in checking fires which came from a distance, and for the origin of which they were in no wise responsible.

#### BRITISH COLUMBIA

The Department of Lands, under the Minister of Lands and the deputy minister of that department, administers the natural resources of this province in connection with land, forest and water. The Forest Branch as a part of this Department is the Forest Authority of the Province. This Branch under a Chief Forester has five main divisions: Management, Grazing, Trade Extension, Operation, and Records. Co-operation with industries and development of policies is assisted by a number of advisory joint committees on the export of raw materials, forest protection, grazing development, scaling of timber, and lumber markets extension.

Under the Management division matters are dealt with concerning timber administration, investigation, royalty inspection and timber management. The Administration is concerned with the disposal of timber and supervises 1,400 logging operations. Under Investigation is included the examination and classification of land, forest surveys, growth studies, volume table compilation and insect and fungus studies. Owing to shortage of trained personnel this branch has not been fully developed. Under Royalty Inspection is included the important work of ascertaining the average selling prices of lumber by which the dues are regulated.

The Grazing division has charge of Crown ranges and the work connected with their upkeep. Under the Operation division the fire-protective work is carried out in conjunction with the organization of the service and personnel matters. The Records division is concerned with accounts, collections, and renewals of licenses and leases.

The Forest Branch is organized under the Chief Forester and Assistant Chief Forester and consists normally of a superior officer in charge of each division with the necessary technical, clerical and stenographic personnel.

There are nine districts, which are in charge of District Foresters, assisted by Supervisors and Rangers. The total staff consisted in 1922 of 218 permanent employees, of whom about 30 are technical foresters. In the fire season, about 200 assistant rangers and patrolmen, in addition to these, are employed.

Technical foresters are required to be graduates of recognized forest schools and are largely recruited from British Columbia, Toronto, New Brunswick, or Washington State (U.S.A.) Universities. Undergraduates are given summer employment wherever possible.

The ranging and scaling staff is selected by a Board of Examiners appointed from the Forest Service staff. Scalers must pass a statutory examination; rangers a Civil Service Examination under the Civil Service Commissioner, and assistant rangers a special departmental examination. Experience in woods work, physical fitness and sufficient education for the carrying on of administrative work are the qualifications in general. These men are nominated by the Advisory Forest Protective Committee, consisting of loggers, timber owners, and forestry officials.

#### ONTARIO

The Department of Lands and Forests under a Cabinet Minister and Deputy Minister has six branches, namely: Lands, Surveys, Forestry, Colonization Roads, Accounts, and Records. So far as the forest administration is concerned there are the three divisions of Timber Protection, Reafforestation, and Investigation.

The timber administration in the field is apportioned in 15 agencies, each in charge of a Crown timber agent, who is assisted by forest rangers. For protection purposes the province is organized into 36 districts grouped into 7 inspectorates. Each district is under a chief fire ranger assisted by deputy chiefs and fire rangers. The duties of the three divisions are as follows:



**Timber Administration.**—Estimating and mapping timber areas for sale; sales; inspection of logging operations; trespass; measurement of timber for collection of dues; settlers' timber rights.

**Protection.**—Patrol, including air machines; fire-fighting; improvement work, such as lookout towers, telephone lines, cabins, trails, and roads; disposal of fire hazards; permits to set out fire; inspection of locomotives; supervision of patrols and other requirements from railways of Dominion Board of Railway Commissioners of Canada; publicity.

**Reforestation.**—Nursery practice; distribution of planting stock; provincial plantations; demonstration plots; county forest plantations; reclamation work; seed collection; inspection of plantations; examination and advice for farm woodlots; lectures and publicity.

**Investigation.**—Forest map of province in progress, to show types, age-classes and conditions (to date 15,270 square miles done by ground parties, 13,500 square miles by combined air and ground parties, and 10,000 square miles by air sketching only).

The head office staff comprises the Minister and Deputy Minister, a Provincial Forester, two foresters and the clerical staff.

The permanent field staff consists of 15 Crown timber agents, 5 district foresters, 17 foresters, and 2 fire inspectors.

The field staff employed only a portion of the year in the capacity named includes 150 scalers and forest rangers, 2 fire inspectors, 36 chief fire rangers, 80 deputy chief fire rangers, 2 locomotive inspectors, and about 1,000 fire rangers, lookout men, boat engineers, car drivers, etc. The men constituting the upper personnel during the fire season form to a large extent the scaling and forest-ranging staff in the winter.

The technical staff includes graduates in forestry of Toronto, Yale, Michigan, and Harvard universities. From 20 to 40 students in training in forestry are used each season in field work.

Of the ranging staff, scalers receive licence after passing government examination. The remainder are largely northern woodsmen, usually with logging experience.

#### QUEBEC

The Department of Lands and Forests of the Provincial Government administers the timber in the province. By different enactments contained in the revised statutes of the province, a Forest Service has been created in this Department and this service has been given charge of the administration of timber lands and matters relating to forestry. This Service may be properly considered as the Forest Authority. It is organized under the Chief of the Forest Service and the Assistant Chief. The staff consists of some twenty or thirty forest engineers, two civil engineers, and a non-technical field force of rangers and cullers. Students of the School of Forestry are employed during the summer season. The Forest Service has charge of the exploration of unsurveyed territory in the province, the classification of soils, the supervision of lumbering operations on Crown Lands, reafforestation, and all other technical work of the Department in connection with forests.

The legislative appropriation for the Forest Service is about \$100,000 annually. The revenue derived from woods and forests is approximately \$1,500,000.

The recruitment and training of superior officers is fully described in connection with the School of Forestry under Section 10 following. Students are employed during the summer months and are encouraged to enter the Provincial Service by this employment and by the granting of scholarships. Rangers and cullers are appointed on practical qualifications with statutory examinations in some cases.

The Minister of the Department publishes an Annual Report containing the report of the Chief of the Forest Service. The Provincial Bureau of Statistics publishes a Statistical Year Book containing Forest Statistics and information concerning provincial forestry matters furnished by the Chief of the Forest Service.

#### NEW BRUNSWICK

The Forest Service under the Department of Lands and Mines and a special Forestry Advisory Commission form the forest authority in New Brunswick.

The Deputy Minister of the Department is the permanent head of the organization. Under him the Provincial Forester supervises the Forest Service with the assistance of an Assistant Forester, Chief Game Warden, Chief Scaler, Forest Assistants and the usual office personnel. The field staff consists of permanent forest rangers and temporary game and fire wardens.

The income derived from the disposal of timber amounted in 1922 to approximately \$652,000. The income of the Department of Lands and Mines as a whole in 1922 was approximately \$853,500.

The technical foresters employed by the Forest Service are recruited chiefly from the forest school in connection with the University of New Brunswick. Permanent rangers and inspectors must be educated, intelligent men between 22 and 45 with experience in woods work, including the scaling of timber, fire protection, and game preservation. They are employed on probation for six months before being permanently appointed and are required to pass examinations in the required subjects. Technical foresters are required to have had woods experience as well as forestry education.

The Annual Report of the Department of Lands and Mines contains the individual reports of the Advisory Commission, the Provincial Fire Inspectors, and the Forest Service Report, together with statistics concerning the expenditure, income, and the utilization of forest products.



## NOVA SCOTIA

There is no Forestry Department in the Nova Scotia Provincial Government. The Forest Authority is the Commissioner of Forests and Game and the only staff organized is that already described under "Fire Protection." (Section 6, subsection B). The cost of this protection is covered by a tax levied on timber-land owners. The rangers are recruited locally and are chosen on account of their experience in the woods and their knowledge of local conditions.

The Commissioner of Crown Lands publishes an Annual Report containing the individual reports of the chief forest rangers.

## 8—Private Forestry Activities

A start has been made toward the development of municipal forests in Ontario through the assistance given by the Provincial Government towards such projects. Throughout the rest of Canada, however, very little has been attempted in this connection. It is only within recent years that private corporations have evinced any interest in the science of forestry, and as yet very few lumber companies employ professional foresters. The pulp companies are beginning to realize that in order to maintain supplies of wood for their mills the practice of forestry on a scientific basis is necessary and at least fourteen companies maintain technical forestry departments. The work of the foresters in private employ has been primarily connected with the surveying and mapping of the forests and the preparation of working plans. In some instances, the entire woods operations have been placed under the charge of a forester and in others, the foresters act in an advisory capacity only. Several of the pulp companies are endeavoring to place their forests on a sustained yield basis, and a few have undertaken artificial regeneration, maintaining nurseries and establishing plantations. There are a number of consulting forest engineers who are employed by private interests to cruise and value forest properties.

Throughout the Prairie Provinces, Ontario and Quebec, there are vast numbers of small plantations and woodlots on the farms, which, though not individually extensive, indicate an interest in forestry, and in the aggregate will be of great benefit to the country, as much for their indirect influence as for the amount of wood produced.

## 9—Professional and other Societies Interested in Forestry

### CANADIAN SOCIETY OF FOREST ENGINEERS

This Society was established in 1908 as an organization of technical foresters with the following objects in view:—

(1) To advance the members in the theory and practice of forestry by the discussion of technical and professional topics;

(2) To promote a better mutual acquaintance among Canadian foresters and to cultivate an esprit de corps among the members of the profession;

(3) To take such steps as may from time to time appear advisable for the purpose of promoting in Canada the interests of the forestry profession as a whole.

The membership is divided into five classes, viz., Honorary, Active, Student, Associate and Non-resident.

Honorary members shall consist of individuals connected with forestry in any of its aspects, who shall be elected by the General Executive Committee.

Active members shall be graduates of a forest school in good standing who shall have been in the practice or teaching of some branch of forestry for at least three years after graduation or shall be men who, while not graduates of a school of forestry, have been engaged in active forestry work for at least five years, during two of which the candidate shall have been an associate member of this Society, and shall have submitted to the General Executive Committee evidence of sufficient technical training. Active membership shall be limited to residents of the Dominion of Canada, or to those who, while residing elsewhere, spend at least the major portion of their time in forestry work within the Dominion of Canada. Only active members shall have the right of voting and holding office.

Student members shall be Canadian students in attendance at a school of forestry.

To qualify for associate membership, the candidate must be connected with the practice, teaching or administration of forestry, the lumber industry or other industry dealing with wood products.

Non-resident members shall possess all the qualifications for active membership except residence or the practice of forestry in Canada.

Active members who do not reside in Canada or may remove therefrom shall be allowed the option of retaining their active membership or transferring to non-resident membership.

Candidates for membership must be proposed by an active member. The name shall, by the member proposing the candidate for membership, be submitted to the Secretary, together with an account of the training, character, and work of such candidate. The name, together with the account aforesaid, shall be referred first to the District Executive Committee, and then forwarded by them to the General Executive Committee (all nominations, whether approved or disapproved, to be so forwarded to the General Executive Committee) and, if approved by six members of the General Executive Committee, the candidate shall be declared a member of the Society in the grade designated.

The membership in 1922 included 3 honorary, 79 active, 68 associate and 5 non-resident members.



The General Executive Committee consists of:—

President—M. A. Grainger, Metropolitan Bldg., Vancouver, B.C.

Vice-president—Dr. C. D. Howe, Faculty of Forestry, University of Toronto, Toronto, Ont.

Treasurer—D. Roy Cameron, Forestry Branch, Ottawa, Ont.

Secretary—Roland D. Craig, Forestry Branch, Ottawa, Ont.

British Columbia Representative, P. Z. Caverhill, Chief Forester, Victoria, B.C.

Prairie Provinces Representative, N. M. Ross, Forest Nursery Station, Indian Head, Sask.

Ontario Representative, R. H. Campbell, Director of Forestry, Ottawa.

Quebec and Maritime Provinces Representative, G. C. Piché, Chief of the Forest Service, Quebec, P.Q.

The official organ of the Society is the "Journal of Forestry," published by the Society of American Foresters, Atlantic Building, Washington, D.C.

#### CANADIAN FORESTRY ASSOCIATION

The Canadian Forestry Association was formed on January 15th, 1900, by a small group of patriotic Canadians concerned in awakening the public conscience to the consequences of unchecked forest destruction. In the terms of the Association's Constitution, its purpose is to advocate and encourage judicious methods in dealing with the forests and woodlands, to press forward the classification of the land area so that provision may be made for permanent forest reserves, to encourage afforestation where advisable, to disseminate, for the benefit of the public, reports and information bearing on the forestry problem in general, and to assist in securing adequate forestry legislation.

Recognizing the extreme importance of arousing public interest and concern in the primary problem of forest fire prevention, the Association has devoted its chief attention to the spread of elementary information on forest preservation, on the causes and prevention of fires, on the economic relationship between the forests and national prosperity and such other constructive facts as will eventually lead the citizens of Canada to realize their personal partnership in, and responsibility for, the state of the forest resources.

The educational methods include a Publicity Bureau, a railway car equipped with forest exhibits and graphic arguments for forest protection, a second railway car used on the Western prairies as a travelling lecture-hall to enlist settlers in tree planting about their homes and farms, the circulation of motion-picture films, the use of lecturers reaching annually over 250,000 people, the holding of essay contests with cash prizes, the preparation and distribution of large editions of booklets, novelties, etc., and a number of other enterprises especially adapted to various classes of citizens and sections of the Dominion. Twelve thousand Canadians have taken out membership in the Association and constitute a most valuable generator of public influence. The "Illustrated Canadian Forestry Magazine" has attained a national circulation and has strengthened the Association's cause materially. Financial support of the Association's work comes from Government grants, private subscriptions, and membership fees, totalling last year approximately \$60,000, with an additional \$14,000 in donated services and materials. The headquarters office is at 51 Sparks St., Ottawa, Ont.

The officers of the Association are:—Patron, His Excellency the Governor General; Honorary President, Rt. Hon. W. L. Mackenzie King; Honorary Vice-President, Hon. Charles Stewart; President, Hon. Adélard Turgeon; Vice-President, Dr. Clifton D. Howe; Manager and Secretary, Robson Black; Publication Manager, Geo. A. Mackie; Assistant Secretary, G. Gerald Blyth; Treasurer, Miss M. Robinson; Past Presidents (Directors ex officio), William Little, Thomas Southworth, Hon. W. A. Charlton, F. C. Whitman, Lt.-Col. J. B. Miller, Col. J. S. Dennis, J. S. Gillies, C. E. E. Ussher, D. McLachlin; Directors (elected), Hon. N. Curry, F. J. D. Barnjum (Nova Scotia); G. H. Prince, Angus McLean, W. E. Golding (New Brunswick); Hon. Sir Lomer Gouin, David Champoux, Sir George Garneau, G. C. Piché, Sir William Price, Brig.-Gen. J. B. White, Geo. Chahoon, Jr., Ellwood Wilson, R. O. Swezey, Arthur H. Campbell (Quebec); Gordon C. Edwards, Clyde Leavitt, R. H. Campbell, Dr. Clifton D. Howe, C. J. Booth, E. J. Zavitz, W. C. Cain, Percy B. Wilson, E. H. Finlayson, J. A. Gillies, J. W. Black, W. E. Bigwood, Cyril T. Young, Hon. Geo. Gordon, Dr. J. G. Rutherford (Ontario); John W. Dafoe, Edw. Fitzgerald, G. W. Allan, K.C. (Manitoba); Hon. W. R. Motherwell, Hon. C. M. Hamilton, Jos. Glenn (Saskatchewan); William Pearce, G. R. Marnoch, Hon. J. E. Brownlee (Alberta); Hon. H. Bostock, Hon. A. C. Flumerfelt, R. D. Prettie, P. Z. Caverhill, Chas. D. McNab, H. R. MacMillan (British Columbia).

#### ASSOCIATION OF FOREST ENGINEERS OF THE PROVINCE OF QUEBEC

This association was founded in Quebec in 1916, obtained a legal status in March, 1921, and has a total membership of 80 engineers.

The aims and objects of this association are to safeguard public interests concerning the management of the forests in the Province of Quebec; to protect its members against the activities of other persons calling themselves "forest engineers," who have not the scientific training; to establish an esprit-de-corps among its members and to advance their standing by the discussion and publication of technical works.

*Membership.*—Any person applying for membership must be at least 21 years of age and a British subject, and must hold a diploma of a forest engineer from the Quebec School of Surveying and Forestry, or from any recognized university of the Province of Quebec, or prove his competence to the satisfaction of the Board of Examiners. This Board of Examiners consists of three members selected by the Board of the Association and two others named by the Director of the School of Surveying and Forestry.

Every year the association publishes a list of the persons who are qualified to act as forest engineers in the Province of Quebec.

*Officers.*—President, O. Lussier, Forest Service, Quebec; Secretary, V. Baillarge.



## NEW BRUNSWICK FOREST CLUB

Incorporated by Letters Patent under The New Brunswick Companies Act, 1916, on July 7, 1917.

*Objects.*—1. The advancement of its members in the theory and practice of forestry by the discussion of technical, professional and practical topics.

2. The promotion of a spirit of greater co-operation between New Brunswick foresters and lumbermen.

3. The furthering of the interests of forestry as a whole in New Brunswick, by any steps which may seem from time to time advisable.

*Officers.*—President, W. B. Snowball; Vice-president, R. B. Miller (resigned); Secretary, L. S. Webb.

*Membership.*—Candidates for membership must be actually engaged in the study, teaching, or administration of forestry, the lumber industry or industries dealing with wood products. The names of such candidates must be proposed for membership by some member of the club and approved by a two-thirds vote of the membership present at any regular meeting.

## TIMBER MANUFACTURERS' ASSOCIATIONS

## CANADIAN LUMBERMEN'S ASSOCIATION (DOMINION)

Organized August, 1908. Number of members, 184.

*Objects.*—(1) To promote the interests and conserve the rights of those engaged in lumbering operations, or in the manufacture, sale, or distribution of lumber; to protect its members against unbusinesslike methods in the wholesale and retail lumber trades; (2) to foster such trades, and reform abuses therein where they exist; (3) to secure freedom from unjust or unlawful exactions; (4) to diffuse accurate information among its members; (5) to secure uniformity in usage, custom, and trade conditions.

*Officers.*—President, A. E. Clark, c/o Edward Clark & Sons, Ltd., Bank of Hamilton Building, Toronto, Ontario; Secretary, —————, 16-18 Fraser Building, Ottawa.

## TIMBER INDUSTRIES COUNCIL OF BRITISH COLUMBIA (PROVINCIAL)

Organized January, 1921. The council, which is an association of associations, represents the following bodies: British Columbia Lumber and Shingle Manufacturers' Association; British Columbia Loggers' Association; Mountain Lumber Manufacturers' Association; Shingle Manufacturers' Association of British Columbia, and the Timberholders Association of British Columbia.

*Objects.*—(1) To promote co-operation and stability in the forest industries of British Columbia and help the development of the timber resources of the Province; (2) to provide central facilities for the association of forest industries and timbermen; (3) to collect and circulate information useful to timber-owners, lumbermen, loggers, and other members of the forest industries.

*Officers.*—President, E. W. Hamber, President and General Manager, B. C. Mills, Timber Trading Co., Vancouver; Managing Director, Wm. McNeil, 911 Metropolitan Building, Vancouver, B.C.

## BRITISH COLUMBIA LUMBER AND SHINGLE MANUFACTURERS' ASSOCIATION

(Lower mainland and Vancouver Island, B.C.)

Organized 1900. Number of members, 49.

*Objects.*—This body, which is incorporated under the Companies Act, with a capital of \$50,000, and whose affairs are administered by a Board of Directors, has, among other objects, the establishment of uniform rules for grading and weighing lumber products, and, as far as possible, standardizing their manufacture, and such other measures as may be deemed for the general welfare of the members of this Association.

*Officers.*—President, F. R. Pendleton, Straits Lumber Co., Red Gap, B.C.; Secretary, R. H. H. Alexander, 917 Metropolitan Building, Vancouver, B.C. Branch Association in Victoria: Secretary, F. Elworthy, Box 86, Victoria, B.C.

## SHINGLE MANUFACTURERS' ASSOCIATION OF BRITISH COLUMBIA (PROVINCIAL)

Organized 1910. Number of members, 60.

*Object.*—The development of the red cedar shingle industry.

*Officers.*—President, J. A. Edgecumbe, Canada Shingle Co., Vancouver, B.C.; Secretary, Fred H. Lamar, Metropolitan Building, Vancouver, B.C.

## BRITISH COLUMBIA LOGGERS' ASSOCIATION

Organized 1907.

*Officers.*—President, Goodwin C. Johnson, North Vancouver, B.C.; Secretary, George W. Muddiman, 912 Metropolitan Building, Vancouver, B.C.

## MOUNTAIN LUMBER MANUFACTURERS' ASSOCIATION (PROVINCIAL)

Organized 1900. Number of members, 35.

*Officers.*—President, A. K. Leitch, Jaffray, B.C.; Secretary, J. R. Poole, Nelson, B.C.



## TIMBERHOLDERS' ASSOCIATION OF BRITISH COLUMBIA

(Allied with the Timber Industries Council of British Columbia)

Number of members, 90.

*Officers.*—President, M. S. Logan, 417 Crown Building, Vancouver, B.C.; Secretary, M. A. Grainger, 911 Metropolitan Building, Vancouver, B.C.

In addition to the above associations there are four other bodies which, though not identified with the Timber Industries Council, are connected directly with the lumber industry in British Columbia. These include the following:—

## NORTHERN BRITISH COLUMBIA TIMBERMEN'S ASSOCIATION

Organized Feb. 11, 1921. Number of members, 15.

*Officers.*—Pres., E. F. Duby, Prince Rupert; Sec., W. E. Simpson, Box 1585, Prince Rupert.

## FOREST PRODUCTS MARKET EXTENSION BUREAU OF BRITISH COLUMBIA

Number of members, 72.

*Officers.*—Chairman, P. A. Wilson, 415 Winch Bldg., Vancouver; Sec.-Man., M. A. Grainger, 911 Metropolitan Bldg., Vancouver.

## ASSOCIATED TIMBER EXPORTERS OF BRITISH COLUMBIA, LTD.

Organized March 21, 1919.

*Officers.*—Pres., J. D. McCormack, Vancouver; Sec., R. H. H. Alexander, 917 Metropolitan Bldg., Vancouver, B.C.

## PACIFIC LUMBER INSPECTION BUREAU

*Officers.*—Sec., R. C. Crackenthorpe, 903-4 Metropolitan Bldg., Vancouver, B.C.

## PULP AND PAPER MANUFACTURERS ASSOCIATION

## CANADIAN PULP AND PAPER ASSOCIATION (DOMINION)

Organized March 8, 1913. Number of members, 50.

*Objects.*—(1) Gathering, compiling and distributing statistics relating to the industry; (2) standardization of production methods; (3) improvement of the technical side of the industry; (4) protection and perpetuation of the forests from which the raw material is drawn; (5) study of freight tariffs and other subjects affecting the welfare of its members; (6) encouragement of technical study among the industry's operatives and the promotion of efficiency in manufacturing methods; (7) surveying of imports and exports and other conditions tending to affect the industry's welfare; (8) advertising of the products of its members and the promotion of the domestic and foreign demand for Canadian pulp and paper.*Officers.*—Pres., Geo. N. McKee, Donnacona, Que.; Sec., Edw. Beck, 701 Drummond Bldg., 511 St. Catherine St. West, Montreal, Que.

## PAPER BOX MANUFACTURERS

## CANADIAN PAPER BOX MANUFACTURERS' ASSOCIATION (DOMINION)

Organized March 3, 1916. Number of members, 43.

*Objects.*—(1) To uphold the standing of the paper-box business by educating the general public to a realization of the usefulness and increasing necessity of the paper box and the extent and size of the paper-box industry; (2) to raise the general standard of efficiency of those in the business whereby the capital involved shall have a proper return thereon, the management shall be adequately rewarded, the wages paid and factory conditions shall be such as to attract a good class of labourer, and to improve the quality of the product turned out; (3) to exchange information as to costs and other matters of general interest relating to the paper-box business; (4) to maintain and continue by social intercourse the good feeling at present existing among the trade and those supplying it.*Officers.*—Pres., C. Winter Brown, D. F. Brown Paper Box and Paper Company, St. John, N.B.; Sec., S. J. Frame, 95 King St. W., Toronto, Ont.

## 10—Education and Research

## FACULTY OF FORESTRY, UNIVERSITY OF TORONTO

One of the first public manifestations of interest in the care and protection of forests on this continent expressed itself in the American Forestry Congress held at Cincinnati, Ohio, in April, 1882. The Province of Ontario sent several delegates to this meeting. Another session of the Forestry Congress was held in Montreal in August of the same year. The stimulus of the public discussions following the Forestry Congress undoubtedly led to the establishment of the position of Clerk of Forestry by the Provincial Government in 1883. The first two incumbents of this office were very active in forestry propaganda, writing extensively for magazines and newspapers and issuing lengthy annual reports, in which they stressed the desirability of establishing a school for the training of foresters. The agitation thus initiated, finally bore fruit in the recommendation for the establishment of such a school in the report of the Royal Commission on



University of Toronto affairs in 1906, and this recommendation in turn resulted in the establishment of the Faculty of Forestry at the University of Toronto in 1907. The late Dr. Bernhard E. Fernow, who had served for more than 20 years as Chief Forester of the United States and who had established the first forest school in America at Cornell University, was invited to come to Canada as Dean of the Faculty, and for 12 years his aggressive but kindly influence was the chief fashioner of forestry in Canada. Upon his retirement Dr. C. D. Howe was appointed Dean. In addition there are three Professors of Forestry on the Faculty.

The Faculty of Forestry of the University of Toronto offers a four-year undergraduate course, leading to the degree of Bachelor of the Science of Forestry. The first two years are devoted mainly to subjects in the fundamental sciences, such as botany, chemistry, geology, mineralogy, physics, surveying, and the modern languages. The last two years are given over almost entirely to forestry subjects. The students are expected to engage in actual field work during their summer vacations. In the academic year one-half of the student's time is taken up with field or laboratory work or in practice camp.

Since the establishment of the Faculty in 1907, about 80 men have graduated. Of these 20 are in the service of the Dominion Government, 21 are employed by the Ontario Government, and 6 are in the service of the British Columbia Government. Nine are employed by private lumber or pulp and paper companies and 20 are in private business.

### L'ÉCOLE D'ARPENTAGE ET DE GÉNIE FORESTIER, QUÉBEC

A School of Forestry was founded by the Government of the Province of Quebec in 1910, primarily for the training of men for its own Forest Service. It has since been amalgamated with the School of Surveying and is now known as L'ÉCOLE D'ARPENTAGE ET DE GÉNIE FORESTIER and is affiliated with Laval University at Quebec. The course covers four years leading to diplomas in both sciences. The *diplôme d'Ingenieur-forestier* is given in forestry. The instruction is given chiefly in the French language, although applicants for admission must be able to read and write English correctly.

The fundamental studies include elementary and advanced Mathematics, Chemistry, Physics, and Mechanics. Special courses are provided in Astronomy, Meteorology, Natural History, Soils, Surveying, Medicine, Public Works Construction, Mineralogy, Geology, Law, Botany, and Hydraulics. The Forestry subjects include Theory of Forestry, Planting, Dendrology, Utilization, Silviculture, Dendrometry, Forest Industries, Wood-using Industries, Forest Protection, Forest Technology, Forest Management, History of Forestry, and Forest Economy and Geography. In addition to lectures, experimental and practical work in field and laboratory is given in connection with most of the subjects. Practical work is arranged for at the Quebec Government Nurseries and in the forests and mills near the city of Quebec.

The School is under the Chief of the Forest Service, Mr. G. C. Piché, M.F., with Mr. Avila Bedard, M.F., as Director, and several professors of the various subjects.

### SCHOOL OF PAPER-MAKING OF THE PROVINCE OF QUEBEC

Realizing the necessity for establishing a school for the teaching of the art of paper-making in the province of Quebec, in order to assure the recruitment of expert working-men, as well as trained paper-engineers for the manufacturing of wood-pulp, paper, and other products derived from cellulose, the Legislature has authorized the Government of Quebec to spend a first amount of \$30,000 to install and equip a school of paper-making, granting to it an annual appropriation of \$25,000 for its maintenance. An elementary school of paper-making will be established next September, at Three Rivers in the heart of the paper industry in Canada. It is proposed to use the present building occupied by the Technical School in that city, combining the two schools so that the men may have good manual and theoretical training. Arrangements have also been made with various pulp and paper mills in the province to employ these students at certain periods of the year.

Later on, a chair of paper-making will be established in connection with a university for the training of technical men, that is, of qualified paper engineers.

### BUREAU OF FOREST RESEARCH

The Quebec Government also voted, in December, 1922, an annual appropriation of \$25,000 for the maintenance of a Bureau of Forest Research, which will be directed by the Chief of the Forest Service and which will be organized in the near future.

### THE FOREST SCHOOL OF THE UNIVERSITY OF NEW BRUNSWICK

With three-fourths of their land area better adapted to growing wood crops than food crops, New Brunswick people have always been deeply concerned in all that affects the conservation of the forest. It was not surprising, therefore, when in the opening years of this century a movement arose to establish a forest school at the Provincial University at Fredericton, in order that men might be trained in correct methods of forest management, and indirectly the public interest be aroused to the need of applied forestry practice on the Crown domain. Undoubtedly the leading spirit in this far-seeing propaganda was Chancellor C. C. Jones, of the University of New Brunswick, and his untiring, far-sighted efforts were crowned with success by the actual starting of such a school in 1908.



Mr. R. B. Miller, M.A., M.F., was appointed Professor of Forestry and started in to build up an effective curriculum.

A tract of 3,640 acres of forest, lying only 3 miles from the University, was turned over to the care of the forest school, and in 1912 the students erected therein a roomy log cabin, which in field work has since proved itself a very valuable addition to the school's equipment.

When Professor Miller resigned in 1916, A. V. S. Pulling, B.S., became Professor of Forestry, and under his direction the school continued to render excellent service. A full four-year forestry course is given leading to the degrees of Bachelor and Master of Forestry.

The numerous graduates of the school may now be found in Government work, in private practice, and in the employ of pulp and paper companies in various parts of Canaha.

## THE FOREST SCHOOL OF THE UNIVERSITY OF BRITISH COLUMBIA

It seems highly fitting that the great pre-eminent forest province of the Dominion, with its vast tracts of commercial timber, should have a forest school as part of its educational system. The University of British Columbia itself opened its doors only in 1915, and the forestry course was not organized until 1921.

Mr. H. R. Christie, F. E., is in charge of the school with the rank of Associate Professor. The outlook for the school is particularly rich in possibilities for serving the rapidly growing needs of the Province for practical professional foresters. A regular four-year undergraduate course is provided which leads to the degree of B. Sc. F.

A special course, designed to give a thorough training in all branches of engineering that apply to the lumber industry, is provided for those who wish to enter the lumber industry equipped as logging engineers. For this purpose, the location of the school at Vancouver offers exceptional advantages, as pulp-mills, extensive forests and lumber operations, large saw-mills and wood-using and wood-preserving plants are all within easy reach. As an essential supplement to the classroom work, the student must obtain experience in actual practice during the summer vacations.

Another unique feature which tends greatly to broaden and improve the forestry course at Vancouver and enlarge the available equipment is the fact that a co-operative scheme exists between the University and the Dominion Forest Products Laboratories, whereby students have access to the latter to watch the investigations in progress, and to use the laboratory in studying the mechanical and physical properties of Canadian woods.

## 11—Annual Increment and Utilization

### A—INCREMENT

No statistics concerning the increment in the forests of Canada are available. The few studies of increment which have been made apply to small areas which are insufficient in extent and number to provide a basis for more than a very rough estimate for the Dominion.

In the report on the Forests of British Columbia by the Commission of Conservation, the following statement is made concerning the increment:—

"If we assume that 97,000 square miles, on which young forests are more or less completely established, produce on the average only 100 board feet per acre, per annum, the total increment would amount to 6,200,000,000 feet, board measure, (1,357,800,000 cubic feet) per annum or about five times the present annual cut of the Province. The realization of this increment is contingent, however, upon the protection of the young growth from fire. No increment is looked for in the mature stands, since decay will undoubtedly offset any growth that may take place."

Though this may be a conservative estimate for British Columbia, it is doubtful whether this average of 21.9 cubic feet per acre per year can be expected from the forests in the rest of Canada. If the forests are maintained in a reasonably productive condition and adequate protection from fire is provided, it should be possible, depending entirely on natural reproduction, to produce on the 765,000,000 acres of forest land, an average increment of from 10 to 15 cubic feet per acre per annum, or a total of from 7,500,000,000 to 11,500,000,000 cubic feet per year, which is three to four and one-half times the present annual consumption.

TABLE III—ANNUAL INCREMENT

—	Area sq. miles	Estimated increment per sq. mile	Total gross increment	Loss			Net increment (col. 4 less col. 8)
				Fire	Waste, decay, etc.	Total	
1	2	3	4	5	6	7	8
Under State control	1,133,425	Not available	Not available	Not available	Not available	Not available	Not available
Other.....	62,500	"	"	"	"	"	"
Total.....	1,195,925	"	"	"	"	"	"

In mature virgin stands there is, of course, no net increment, and on a large proportion of the cut-over and burned-over land the stands are insufficiently stocked, so that, without considering the loss from fire and other destructive agencies, it is doubtful whether, at the present time, the forests are growing much faster than they are being cut.



B—UTILIZATION

Complete statistics as to the total amount of timber cut is secured only for the decennial census. The production as shown by the last census (1921) is given in table IV but it must be pointed out that in 1920 both the quantities and values of the principal products were higher than normal.

TABLE IV—ANNUAL UTILIZATION

—	Type of Product	Quantity			Value
			Used Volume M cubic feet	Equivalent in Standing Timber M cubic feet	
Under State control and other. (No division possible)	Lumber.....	4, 298, 804 M B.F.	359, 067	941, 438	\$168, 171, 987
	Lath.....	762, 031 M pcs.	10, 545	.....	5, 248, 879
	Shingles.....	2, 855, 706 M pcs.	23, 798	62, 825	14, 695, 159
	Square timber, exported.....	45, 510 M B.F.	3, 793	9, 667	1, 899, 444
	Logs, exported.....	65, 505 M B.F.	5, 459	14, 346	1, 836, 315
	Railway ties.....	16, 845, 000 pcs.	50, 535	202, 140	13, 405, 473
	Posts.....	14, 136, 397 pcs.	21, 204	28, 273	1, 396, 751
	Poles.....	571, 111 pcs.	5, 711	7, 424	655, 467
	Pulpwood.....	4, 024, 826 cords	362, 234	470, 905	61, 183, 060
	Firewood (cut).....	8, 656, 669 cords	779, 100	822, 383	37, 436, 000
	Miscellaneous, other.....	.....	35, 740	56, 730	6, 754, 974
Total.....		.....	1, 657, 186	2, 616, 131	312, 683, 509

The consideration of increment and utilization is not complete without mention of the losses sustained through fire, insects, fungi, wind, etc. During the last five years 723,250 acres of merchantable timber have been burned over annually. At the low estimate of 5,000 feet board measure (1,095 cubic feet standing timber), the amount of timber destroyed annually would be 3,616,250,000 feet board measure or 791,858,700 cubic feet. In addition there were over 800,000 acres of young growth and 500,000 acres of cut-over land burned over, on which the increment of perhaps 30 years, on the average, was destroyed.

During the last ten years, the spruce budworm has caused tremendous damage to the spruce and balsam fir forests in eastern Canada. In Quebec it is estimated that 100 million cords of pulpwood have been destroyed by this insect, and in New Brunswick the loss is placed at 15 million cords, a total equivalent to 13,455,000,000 cubic feet of standing timber, an average of nearly 1,350,000,000 cubic feet per year. Even though the active stage of the infestation is practically over, large amounts of timber continue to die every year as a result of previous defoliation. Other insects, though not so destructive as this one, entail a heavy drain on the forest increment.

Though the attacks of fungi are more insidious the loss caused from the various forms of rot and other fungous diseases is probably not less than that caused by insects under normal conditions. The butt rot in balsam fir is especially prevalent, and the value of the hardwoods is very greatly decreased on account of rot. Poplar and white birch seldom reach over 10 inches in diameter without considerable decay, and, since these species form such a large proportion of the young growth, the loss, though it has never been computed, must be very great.

With an annual utilization of about 2,600,000,000 cubic feet, destruction by fire of 790,000,000 cubic feet, destruction by insects of 1,350,000,000 cubic feet and an unknown loss due to the fungous diseases, the forests have, during the last five years, been depleted at the rate of upwards of 5,000,000,000 cubic feet per annum. It would appear, therefore, that the forest capital of Canada is being materially reduced, owing primarily to the failure to provide for a future crop when cutting and the lack of protection from fire for the natural reproduction.

12—Forest Industries

The forest industries are second only to agriculture in value of production in Canada. The principal industries are lumbering, which includes the manufacture of lath and shingles, and the manufacture of pulp and paper. In addition to these industries, large quantities of timber are used for fuel, railway ties, poles, piling, posts, mine-props, etc.

Complete statistics as to the amount of timber consumed are secured only for the decennial census; but since 1908, annual records have been kept of the production of lumber, lath, shingles, pulpwood, and paper.

TABLE V.—FOREST INDUSTRIES  
(Average for 5 years, 1917 to 1921)

Industry	Volume of Timber Consumed (Equivalent in Standing Timber)	Value of Product at the place of Preparation	Number of Persons employed
Lumber Industry—			
	M Cubic Feet	\$	
Lumber.....	3, 806, 003 M ft. B.M.	833, 515	In Mills.....32, 965
Lath.....	697, 946 M pieces	22, 794	
Shingles.....	2, 888, 214 M pieces	63, 540	
Total.....	919, 849	126, 112, 265	
Pulp and Paper Industry—			
Pulpwood exported.....	1, 155, 524 cords	135, 196	In Mills.....25, 342
Pulp exported.....	.....	12, 382, 314	
Paper produced.....	2, 340, 357 cords	{ 41, 251, 098 93, 258, 069	
Total.....	409, 022	146, 891, 481	In Lumber and pulpwood operations in woods (estimated).....48, 000
Grand total.....	1, 328, 871	273, 003, 746	106, 307



Lumbering has been one of the principal industries since the earliest settlement and has steadily increased in importance with the development of the country. Though the quantity of lumber produced has not increased materially since 1908—averaging approximately 4,000,000,000 feet, board measure (333,333,333 cubic feet), from 1908 to 1920—the value has risen from \$54,383,036 in 1908 to \$168,368,437 in 1920. The greatest quantity production was in 1911, when 4,918,202,000 feet board measure, valued at \$75,830,954, were produced.

Laths are chiefly a by-product of the lumber industry, being made from slabs and other mill refuse, and the production corresponds closely with the amount of lumber sawn. On the average about 300,000,000 lath, valued at \$822,545, are produced.

The production of roofing shingles is increasing greatly both in quantity and total value. This is due to the development of the red cedar shingle industry in British Columbia. The production has increased from 43,739,000 shingles, valued at \$226,703, in 1908, to 223,533,000, worth \$461,115, in 1920. The average annual production for these years has been 130,781,000 shingles, valued at \$354,595.

Though the first paper-mill was established in St. Andrews, Quebec, in 1803, the greatest development of the pulp and paper industry has been in the last twenty years. In 1901 there were only 25 mills with a capital investment of \$11,558,560 and an output valued at \$4,246,780. In 1920 there were 67 mills with a capital investment of \$347,000,000, and the value of the output was \$142,000,000 for pulp and \$137,000,000 for paper.

In 1908 the total amount of pulpwood cut was 1,325,085 cords, valued at \$7,732,055, of which only 482,777 cords were used in Canada and 842,308 cords were exported to be manufactured in United States mills. In 1920, 4,024,825 cords valued at \$61,183,060 were cut and 2,777,422 cords were used in Canadian mills and 1,247,404 cords exported.

TABLE V (a) -AVERAGE PRODUCTION OF LUMBER, LATH, SHINGLES, AND PULPWOOD BY PROVINCES  
FOR 5 YEARS 1917 TO 1921

Province	Lumber		Lath		Shingles		Pulpwood		Volume used	Equivalent in standing timber	Total value
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value			
<i>Eastern Provinces</i>	M ft.B.M.	\$	M pieces	\$	M pieces	\$	cords	\$	M cu. ft.	M cu. ft.	\$
Nova Scotia.....	205,416	5,455,219	24,213	108,486	16,127	53,436	34,239	411,916	20,668	49,346	6,029,057
New Brunswick.....	463,899	13,235,128	169,164	810,890	236,106	882,363	334,516	3,693,548	73,064	145,926	18,621,929
Quebec.....	823,805	24,293,128	115,671	513,233	317,484	1,204,114	1,898,485	22,653,383	243,749	409,521	49,293,858
Ontario.....	977,496	32,188,906	228,412	1,039,591	61,703	261,829	1,000,610	14,458,052	175,184	332,500	47,948,378
Total.....	2,470,616	75,902,381	537,460	2,472,200	631,420	2,401,742	3,267,850	41,216,899	512,665	937,293	121,893,222
<i>Prairie Provinces</i>											
Manitoba.....	51,752	1,319,307	10,526	42,806	63	371	82	831	4,466	11,345	1,363,315
Saskatchewan.....	54,385	1,566,548	8,059	46,364	4,500	16,474			4,680	12,009	1,629,386
Alberta.....	29,884	779,695	995	3,169	1,366	6,335			2,515	6,575	789,199
Total.....	136,021	3,665,550	19,580	92,339	5,929	23,180	82	831	11,661	29,929	3,781,900
British Columbia.....	1,192,391	32,387,564	69,962	397,756	2,242,697	8,663,788	227,938	2,912,542	139,462	337,141	44,361,650
Grand total.....	3,799,028	111,855,495	627,002	2,962,295	2,880,046	11,088,710	3,495,870	44,130,272	663,788	1,304,363	170,036,772

TABLE V (b).—LUMBER PRODUCED IN CANADA, 1908 TO 1921

Year	Quantity of Lumber produced	Volume used	Equivalent standing timber	Value of lumber produced	Average value per M ft. B.M.
	M ft. B.M.	M cu. ft.	M cu. ft.	\$	\$
1908.....	3,347,126	278,927	733,021	54,338,036	16.27
1909.....	3,814,942	317,912	835,472	62,819,477	16.41
1910.....	4,451,652	370,971	974,914	70,609,233	15.81
1911.....	4,918,202	409,850	1,077,086	75,630,954	15.42
1912.....	4,389,723	365,810	961,349	69,475,784	15.83
1913.....	3,816,642	318,054	835,845	65,796,438	17.24
1914.....	3,946,254	328,854	864,230	60,363,369	15.30
1915.....	3,842,676	320,223	841,546	61,919,806	16.11
1916.....	3,490,550	290,879	764,430	58,365,349	16.72
1917.....	4,151,703	345,975	909,224	83,655,097	20.15
1918.....	3,886,631	323,886	851,172	103,700,620	26.28
1919.....	3,819,750	318,312	836,525	122,030,653	31.95
1920.....	4,302,625	358,552	942,275	168,368,437	39.13
1921.....	2,869,307	239,109	628,378	82,448,585	28.73

TABLE V. (c).—LATH PRODUCTION IN CANADA, 1908-1921

Year	Quantity produced in M pcs.	Volume used M cu. ft.	Value of lath produced	Average value per M pcs.
			\$	\$
1908.....	672,362	9,299	1,489,525	2.21
1909.....	732,136	10,125	1,709,865	2.33
1910.....	852,453	11,789	1,943,544	2.28
1911.....	965,235	13,350	2,212,226	2.29
1912.....	897,004	12,405	2,064,622	2.30
1913.....	751,052	10,387	1,787,325	2.37
1914.....	625,010	8,644	1,585,484	2.54
1915.....	973,226	10,970	2,040,819	2.57
1916.....	665,498	9,203	1,743,940	2.62
1917.....	616,949	8,532	1,828,018	2.96
1918.....	438,100	6,059	1,369,616	3.13
1919.....	520,203	7,194	2,157,758	4.15
1920.....	760,031	10,511	5,248,879	6.90
1921.....	804,449	11,127	4,188,121	5.21

NOTE.—Equivalent in standing timber not given since lath is mostly a by-product of the lumber industry.



TABLE V (d).—SHINGLE PRODUCTION IN CANADA, 1908-1921

Year	Quantity shingles produced	Volume used	Equivalent in standing timber	Value of shingles produced	Average value per M pieces
	M pieces	M cu. ft.	M cu. ft.	\$	\$
1908.....	1,506,396	12,503	33,141	3,109,046	2.06
1909.....	1,708,908	14,184	37,596	3,408,702	1.99
1910.....	1,976,640	16,406	43,486	3,557,211	1.80
1911.....	1,838,474	15,259	40,446	3,512,078	1.91
1912.....	1,578,343	13,100	34,724	3,175,319	2.01
1913.....	1,485,279	12,328	32,676	3,064,641	2.06
1914.....	1,843,554	15,301	40,558	3,688,746	2.00
1915.....	3,089,470	25,643	67,968	5,734,852	1.86
1916.....	2,897,562	24,050	63,746	5,962,933	2.06
1917.....	3,020,956	25,074	66,461	8,431,215	2.79
1918.....	2,662,521	22,099	58,875	8,184,448	3.07
1919.....	2,915,309	24,197	64,137	13,525,625	4.63
1920.....	2,855,706	23,702	62,826	14,695,159	5.15
1921.....	2,986,580	24,789	65,705	10,729,096	3.59

TABLE V (e).—PULPWOOD PRODUCTION IN CANADA, 1908-1921

Year	For home consumption	For export	Total	Volume used	Equivalent in standing timber	Total value	Average value per cord
	Cords	Cords	Cords	M cu. feet	M cu. feet	\$	\$ cts.
1908.....	482,777	842,308	1,325,085	119,258	155,035	7,732,055	5 84
1909.....	622,129	935,622	1,557,753	140,198	182,256	9,316,610	5 98
1910.....	598,487	943,141	1,541,628	138,747	180,370	9,795,196	6 35
1911.....	672,288	847,939	1,520,227	136,820	170,867	9,678,616	6 37
1912.....	866,042	980,868	1,846,910	166,222	214,248	11,911,415	6 02
1913.....	1,109,034	1,035,030	2,144,064	192,966	250,855	14,313,939	6 68
1914.....	1,224,376	972,508	2,196,884	197,720	255,036	14,770,358	6 72
1915.....	1,405,836	949,714	2,355,550	212,000	275,599	15,590,330	6 62
1916.....	1,764,912	1,068,207	2,833,119	254,981	331,490	19,971,127	7 05
1917.....	2,104,334	1,017,854	3,122,188	280,997	365,296	26,739,905	8 56
1918.....	2,210,744	1,349,536	3,560,280	320,425	416,553	37,886,259	10 64
1919.....	2,428,706	1,070,275	3,498,981	314,908	409,381	41,941,267	11 99
1920.....	2,777,422	1,124,404	4,024,826	362,234	471,905	61,183,060	15 21
1921.....	2,180,578	1,092,553	3,273,131	294,582	382,957	52,900,872	16 16

TABLE V (f).—AVERAGE QUANTITY OF STANDING TIMBER CUT FOR LUMBER, LATH, SHINGLES AND PULPWOOD FOR 5 YEARS, 1917 TO 1921, BY KINDS OF WOOD

Kind of Wood	Cut in cubic feet
Spruce.....	578,423,000
Douglas fir.....	168,501,000
White pine.....	132,666,000
Balsam fir.....	110,128,000
Cedar.....	86,587,000
Hemlock.....	82,430,000
Red pine.....	20,934,000
Birch.....	17,319,000
Jack pine.....	13,514,000
Western yellow pine.....	13,123,000
Larch.....	11,981,000
Maple.....	9,347,000
Basswood.....	5,287,000
Poplar.....	4,995,000
Elm.....	4,496,000
Beech.....	2,287,000
Ash.....	1,775,000
Oak.....	683,000
Yellow Cypress.....	357,000
Chestnut.....	120,000
Cherry.....	80,000
Butternut.....	70,000
Hickory.....	40,000
Walnut.....	10,000
Red Alder.....	5,000
Unspecified.....	39,205,000
	1,304,363,000

Factors Used for Converting Various Units of Measurement of Wood to Cubic Feet

Product	Unit in use in Canada	Volume used	Equivalent in standing timber
		Cubic feet	Cubic feet
Sawn lumber.....	1,000 ft. B.M.	83.33	219
Logs.....	1,000 "	83.33	219
Shingles.....	1,000 pieces	8.33	22
Lath.....	1,000 "	13.83	36.3
Pulpwood.....	1 cord	90.00	117
Fuelwood.....	1 "	90.00	95
Distillation wood.....	1 "	90.00	123
Railway ties (hewed).....	1 piece	3.00	12
Poles.....	1 "	10.00	13
Piling.....	1 "	10.00	13
Fence-posts.....	1 "	1.50	2



### 13—Statistics as to Exports and Imports of Timber

In the external trade of Canada, the products of the forest are an important factor in reducing the prevailing adverse balance. The total value of the trade in forest products during 1919-1922 amounted to approximately \$258,000,000 annually, of which exports amount to \$227,000,000 and imports \$31,000,000, leaving a credit balance of \$196,000,000. Since \$110,000,000 of this balance is in the trade with the United States, it is of material assistance in stabilizing the exchange between the two countries.

In order to show a true value of the forests in the external trade of Canada, all of the products which are essentially wood products should be included, even though a considerable proportion of the value of some of these products represents the value of the labour employed in their manufacture. Products, such as agricultural implements and printed matter, though composed partly of wood, are not considered primarily forest products and are, therefore, not included.

The first group of products headed "Logs, Sawn Lumber, and Other Unmanufactured or Partly Manufactured Wood" may be considered as within the definition of "timber."

Statistics are not available as to the species of wood exported or imported, but the principal woods exported are undoubtedly spruce, Douglas fir, white pine, western red cedar, and hemlock. The imports are chiefly of hardwood and high-grade paper. The quantities are not recorded for many of the manufactured products, so it is impossible to state the total quantity of wood exported or imported. Figures are given below, however, for several of the more important primary products.

TABLE VI—AVERAGE ANNUAL IMPORTS AND EXPORTS FOR YEARS 1919 TO 1922

Type of Product (1)	Exports		Imports		Difference—Excess or Deficit	
	Quantity (2)	Value (f.o.b.) (3)	Quantity (4)	Value (5)	Quantity Col. 2-Col. 4	Value Col. 3-Col. 5
		\$		\$		\$
Logs, Sawn Lumber, and other unmanufactured and partly manufactured wood—						
Lumber..... M ft. B.M.	1,685,725	60,319,756	160,447	9,311,541	1,525,278	+51,008,215
Square timber..... "	51,102 <sup>3</sup>	1,756,133		152,480		+1,603,653
Shingles..... M pieces	2,136,398	9,230,166	6,112	23,616	+2,130,286	+9,206,550
Lath..... "	834,448	5,016,980	4,948	37,832	+829,500	+4,979,148
Veneer..... "		113,332 <sup>2</sup>		556,231		-442,899
Railway ties..... Pieces	1,315,303 <sup>3</sup>	1,682,948 <sup>3</sup>	992,115 <sup>3</sup>	1,374,543	+323,188	+308,405
Logs..... M ft. B.M.	152,405 <sup>2</sup>	2,287,989		420,422		+1,867,567
Pulpwood..... Cords	1,105,391	12,837,281				+12,837,281
Poles..... Pieces	190,439 <sup>3</sup>	768,006 <sup>3</sup>	49,464 <sup>3</sup>	183,080	+140,975	+584,926
Piling..... Lin. feet	1,382,512 <sup>2</sup>	141,599 <sup>2</sup>				+141,599
Posts..... "		50,477		18,827 <sup>3</sup>		+31,650
Fuel-wood..... Cords	17,359	84,184	9,058 <sup>3</sup>	36,070		+48,114
Bamboo, Cane and Reed.....				324,561		-324,561
Miscellaneous.....		2,649,420		551,058		+2,098,362
		96,938,271		12,990,261		+83,948,010
Manufactured Wood—						
Furniture, caskets and coffins.....		470,179		1,429,462		-959,283
Handles, turned and carved wood.....		188,420 <sup>3</sup>		689,783		-501,363
Doors, sashes, mouldings, etc.....		178,815		437,858		-259,043
Cooperage.....		174,925		748,593		-573,668
Cork.....				533,384		-533,384
Miscellaneous.....		2,204,700		2,728,123		-523,423
		3,217,039		6,567,203		-3,350,164
Wood-pulp—						
Mechanically ground pulp. Cwt.	5,770,747 <sup>3</sup>	10,859,763 <sup>3</sup>				+10,859,763
Chemical pulp—						
Sulphate (kraft)..... "	2,540,140 <sup>3</sup>	9,723,834 <sup>3</sup>				+9,723,834
Sulphite bleached..... "	2,160,968	11,586,185		7,336		+11,578,849
" unbleached..... "	5,076,342	20,095,351		878,964		+19,216,387
Soda.....				80,717		-80,717
Fibre, kartavert fibre, vulcanized fibre and like material.....				335,248		-335,248
Mechanically and chemically prepared.....				343,191		-343,191
	15,548,197	52,265,133		1,645,456		+50,619,677
Paper (except printed matter)—						
Printing paper and newsprint..... Cwt.	15,710,770 <sup>2</sup>	65,628,135 <sup>3</sup>		797,937		+64,830,198
Writing paper.....	17,713	448,033		381,134		+66,899
Packing and wrapping paper..... Cwt.	315,071	2,731,219 <sup>3</sup>		800,568		+1,930,651
Bags, boxes and cartons.....		86,369				+86,369
Tissue paper.....				404,532		-404,532
Paper board.....		3,710,082		2,216,086		+1,493,996
Wall paper..... Rolls	3,187,279	464,803		364,819		+99,884
Building and roofing paper.....		336,182		418,489		-82,307
Miscellaneous.....		846,905		4,598,693		-3,751,788
		74,251,728		9,982,258		64,269,470
Grand Total.....		226,672,171		31,185,178		+195,486,993

<sup>2</sup>Indicates 2 years average.

<sup>3</sup> " 3 years average.

+ " value of exports over imports.

- " value of imports over exports.



TABLE VI (a).—EXPORTS OF FOREST PRODUCTS, 1919 TO 1922

Logs, Sawn Lumber, and other unmanufactured and partly manufactured wood.	Quantity				Value			
	1919	1920	1921	1922	1919	1920	1921	1922
Sawn lumber..... M ft. B.M.	1,796,139	1,024,682	1,024,227	1,997,852	\$ 62,735,640	\$ 83,330,479	\$ 37,159,008	\$ 53,053,896
Logs..... " "			119,321	185,489	1,640,281	2,111,063	2,124,383	3,276,231
Piling..... Lin. feet			1,399,486	1,365,538			163,907	119,290
Fence posts..... Pieces							36,933	64,020
Square timber..... M ft. B.M.		43,063	55,103	55,140	1,933,216	1,899,444	1,699,530	1,492,344
Railway ties..... Pieces		1,127,325	1,853,296	965,288		2,116,411	2,248,185	684,247
Poles, telegraph and telephone " "		112,184	152,713	306,421		439,092	653,334	1,211,592
Shingles..... M pieces	2,023,156	1,970,466	2,192,979	2,358,992	8,782,221	11,419,955	7,507,526	9,210,961
Lath..... M " "	800,345	446,404	803,132	1,295,910	3,016,971	4,105,953	5,301,286	7,643,710
Veneer.....							61,010	165,653
Pulpwood..... Cords	1,070,275	1,247,404	1,092,553	1,011,332	10,593,581	15,778,171	14,617,610	10,359,762
Fuel-wood..... " "	16,163	29,880	11,824	11,570	67,658	117,224	81,686	70,168
Miscellaneous wood.....					4,268,241	1,915,627	2,459,757	1,954,058
					93,037,809	123,233,419	74,114,155	94,305,932
Manufactured Wood—								
Furniture, caskets, coffins, etc.....					472,608	863,195	319,253	225,661
Handles, turned and carved wood, etc.....						156,565	201,905	206,789
Doors, sashes, mouldings, etc.....					175,531	279,444	138,967	121,318
Cooperage.....					181,429	318,930	130,639	63,701
Miscellaneous wood.....					2,350,066	2,998,980	1,802,941	1,666,814
					3,179,634	4,617,114	2,593,705	2,289,283
Wood-pulp—								
Chemical pulp—sulphate (kraft)..... Cwt.		2,662,929	1,990,772	2,966,720		12,805,460	7,199,223	9,166,818
Chemical pulp—sulphite bleached..... " "		2,012,796	1,536,022	2,934,086		15,225,226	7,540,128	11,993,202
Chemical pulp—sulphite unbleached..... " "	7,951,570	5,637,089	2,547,786	4,168,924	30,002,558	30,778,486	9,122,612	10,477,746
Mechanically ground pulp..... " "	6,231,024	6,086,883	4,469,876	6,295,204	7,182,451	17,574,806	9,271,712	9,410,083
	14,182,594	16,399,697	10,544,456	16,364,934	37,185,009	76,383,978	33,133,675	41,047,849
Paper (except printed matter)—								
Printing paper and newsprint..... Cwt.	14,205,115	15,297,659	14,118,319	19,221,986	50,144,725	73,548,343	70,230,945	68,588,527
Writing paper.....			23,198	12,228		800,037	411,083	132,980
Packing and wrapping paper..... Cwt.	368,331	379,746	140,037	372,170	2,959,505	3,860,868	1,324,117	2,780,386
Bags, boxes and cartons.....						102,493	81,184	75,432
Paper board.....					4,352,759	5,885,439	2,273,293	2,328,829
Wall paper..... Rolls	3,517,326	4,602,663	3,064,043	1,565,083	333,415	656,170	618,157	251,470
Building and roofing paper.....					420,779	542,776	157,279	223,893
Miscellaneous paper.....					1,180,472	1,347,884	414,887	444,376
					59,391,655	86,744,010	75,510,945	74,825,893
Total.....					192,794,107	290,978,521	185,352,480	212,468,957

TABLE VI (b).—IMPORTS OF FOREST PRODUCTS, 1919 TO 1922

	Quantity				Value			
	1919	1920	1921	1922	1919	1920	1921	1922
Logs, sawn lumber and other unmanufactured and partly manufactured wood—					\$	\$	\$	\$
Lumber, rough-sawn..... M ft. B.M.	116,011	112,978	70,526	83,154	6,031,214	11,223,917	3,974,677	4,925,143
Lumber, dressed on one side.....	81,258	52,697	46,273	59,246	3,016,629	3,340,359	1,678,839	2,034,626
Lumber, matched..... " "	4,904	2,318	7,181	5,242	259,980	217,753	266,717	276,309
Logs.....					461,190	496,740	465,622	268,136
Timber, hewn, sawn, squared or sided.....					386,243	150,468	35,832	37,377
Railway ties..... Pieces		994,319	1,441,601	540,424	1,362,360	1,121,095	2,335,697	679,020
Fence posts.....						31,640	11,389	13,453
Poles, telegraph and telephone..... Pieces		115,957	30,544	1,892	382,885	268,620	73,805	7,011
Shingles..... M Pieces	1,823	8,328	4,433	10,065	7,168	30,570	20,415	36,309
Lath..... " "	3,307	8,355	7,157	962	13,376	80,258	51,274	6,421
Veneer.....					543,653	1,040,375	343,365	297,550
Fuel-wood..... Cords		9,277	8,895	9,002	41,414	31,194	35,101	86,571
Bamboo, cane, reed and cork.....					273,853	482,660	285,373	286,356
Miscellaneous.....					531,666	1,089,841	330,748	251,976
					13,311,611	19,605,490	9,878,854	9,146,258
Manufactured wood—								
Furniture, caskets and coffins.....					1,111,033	1,922,911	1,363,101	1,320,804
Handles, turned and carved wood.....					778,146	882,256	438,587	660,142
Doors, sashes and mouldings.....					305,195	397,762	368,362	680,112
Cooperage.....					792,643	1,305,920	515,247	380,561
Cork, manufactures of.....					429,091	778,710	444,246	481,489
Miscellaneous.....					2,593,197	4,001,494	2,388,042	1,929,760
					6,009,305	9,289,053	5,517,585	5,452,868
Wood-pulp—								
Fibre, kartavert fibre and vulcanized fibre, and like materials.....					293,055	409,978	308,487	329,471
Bleached Sulphite.....					6,467	6,082	2,200	14,593
Soda-pulp.....					91,958	94,865	29,432	106,614
Unbleached pulp.....					446,967	935,991	1,269,580	863,319
Wood-pulp, mechanically and chemically prepared.....					63,412	903,523	381,829	24,001
					901,850	2,350,439	1,991,528	1,337,998
Paper (except printed books and printed paper)—								
Printing paper and newsprint.....					806,395	1,153,956	574,366	657,029
Writing paper and stationery.....					338,607	459,063	381,944	344,923
Packing and wrapping paper and bags.....					649,179	1,239,258	520,628	793,205
Tissue paper.....					248,192	496,920	376,730	496,287
Cardboard.....					2,056,815	3,411,063	1,888,098	1,508,370
Wall paper.....					337,239	449,111	328,738	344,191
Building and roofing paper.....					387,149	625,951	292,490	368,366
Miscellaneous.....					4,363,103	6,223,724	4,032,106	3,775,840
					9,186,676	14,059,046	8,359,100	8,288,211
Total.....					29,409,451	45,804,028	25,783,067	24,225,335



TABLE VI (c)—SUMMARY OF THE VALUE OF THE EXPORTS AND IMPORTS OF FOREST PRODUCTS, 1919 TO 1922

Kind of Product	Exports — Value	Imports — Value	Difference— Excess or Deficit Value
	\$	\$	\$
Logs, sawn lumber and other manufactured and partly manufactured wood			
1919.....	93,037,809	13,311,611	+ 79,726,198
1920.....	123,233,419	19,605,490	+103,627,929
1921.....	74,114,155	9,878,854	+ 64,235,301
1922.....	94,305,932	9,146,258	+ 85,159,674
Manufactured wood—			
1919.....	3,179,634	6,009,305	— 2,829,671
1920.....	4,617,114	9,289,053	— 4,671,939
1921.....	2,593,705	5,517,585	— 2,923,880
1922.....	2,239,283	5,452,868	— 3,163,585
Wood-pulp—			
1919.....	37,185,009	901,859	+ 36,283,150
1920.....	76,383,978	2,350,439	+ 74,033,539
1921.....	33,133,675	1,991,528	+ 31,142,147
1922.....	41,047,849	1,337,998	+ 39,709,851
Paper (Except printed matter)—			
1919.....	59,391,655	9,186,676	+ 50,204,979
1920.....	86,744,010	14,059,046	+ 72,684,964
1921.....	75,510,945	8,395,100	+ 67,115,845
1922.....	74,825,893	8,288,211	+ 66,537,682
Total—			
1919.....	192,794,107	29,409,451	+163,384,656
1920.....	290,978,521	45,304,028	+245,674,493
1921.....	185,352,480	25,783,067	+159,569,413
1922.....	212,468,957	24,225,335	+188,243,622

+ Shows value of exports over imports.  
— Shows value of imports over exports.

TABLE VI (d)—EXPORTS OF FOREST PRODUCTS TO UNITED KINGDOM, UNITED STATES AND OTHER COUNTRIES, 1919 TO 1922

	1919				1920			
	United Kingdom	United States	Other Countries	Total	United Kingdom	United States	Other Countries	Total
Logs, sawn lumber and other unmanufactured and partly manufactured wood....	\$ 29,391,321	\$ 60,055,019	\$ 3,590,569	\$ 93,037,809	\$ 25,418,053	\$ 90,194,042	\$ 7,621,324	\$ 123,233,419
Manufactured wood.....	1,741,438	709,314	729,882	3,179,634	1,813,634	1,402,775	1,395,705	4,617,114
Wood-pulp.....	4,715,465	27,970,024	4,499,520	37,185,009	8,543,119	61,669,129	6,171,731	76,383,978
Paper (except printed matter).....	3,707,273	46,750,697	8,933,655	59,391,655	4,874,455	67,722,284	14,147,271	86,744,010
	39,555,497	135,484,954	17,753,656	192,794,107	40,654,261	220,983,230	29,336,031	290,978,521
	1921				1922			
	United Kingdom	United States	Other Countries	Total	United Kingdom	United States	Other Countries	Total
Logs, sawn lumber and other unmanufactured and partly manufactured wood....	\$ 8,175,818	\$ 59,736,786	\$ 6,201,551	\$ 74,114,155	\$ 11,047,024	\$ 76,373,896	\$ 6,885,012	\$ 94,305,932
Manufactured wood.....	986,323	896,967	710,415	2,593,705	840,022	862,783	586,478	2,289,283
Wood-pulp.....	6,001,207	23,752,418	3,370,050	33,133,675	4,942,600	33,093,301	3,011,948	41,047,849
Paper (except printed matter).....	1,208,324	64,994,234	9,308,387	75,510,945	2,886,882	65,000,332	6,938,679	74,825,893
	16,371,672	149,390,405	19,590,403	185,352,480	19,716,528	175,330,312	17,422,117	212,468,957

TABLE VI (e)—IMPORTS OF FOREST PRODUCTS FROM UNITED KINGDOM, UNITED STATES AND OTHER COUNTRIES, 1919 TO 1922

	1919				1920			
	United Kingdom	United States	Other Countries	Total	United Kingdom	United States	Other Countries	Total
Logs, sawn lumber and other unmanufactured and partly manufactured wood.....	\$ 6,370	\$ 13,258,198	\$ 47,043	\$ 13,311,611	\$ 71,062	\$ 19,443,278	\$ 91,150	\$ 19,605,490
Manufactured wood.....	109,274	5,660,922	239,109	6,009,305	314,307	8,322,943	651,803	9,289,053
Wood-pulp.....	1,966	899,893	.....	901,859	2,298	2,343,127	14	2,350,439
Paper (except printed matter).....	278,256	8,670,884	237,536	9,186,676	758,142	12,781,089	519,815	14,059,046
	395,866	28,489,897	523,788	29,409,451	1,145,809	42,895,437	1,262,782	45,304,028
	1921				1922			
	United Kingdom	United States	Other Countries	Total	United Kingdom	United States	Other Countries	Total
Logs, sawn lumber and other unmanufactured and partly manufactured wood.....	\$ 23,262	\$ 9,769,177	\$ 86,415	\$ 9,878,854	\$ 16,913	\$ 9,073,488	\$ 45,867	\$ 9,146,258
Manufactured wood.....	495,460	4,610,986	501,139	5,517,585	284,406	4,740,603	427,859	5,452,868
Wood-pulp.....	2,170	1,989,137	221	1,991,528	2,716	1,335,239	43	1,337,998
Paper (except printed matter).....	629,509	7,204,713	560,878	8,395,100	819,978	7,052,204	416,029	8,288,211
	1,060,401	23,574,013	1,148,653	25,783,067	1,124,013	22,201,534	889,798	24,225,335

## 14—Summary and Outlook

### A.—CONSUMPTION COMPARED WITH INCREMENT

As pointed out in Section 11, there are no reliable data on which to place an estimate of the amount of increment. Most of the merchantable timber is in virgin stands in which decay offsets the growth, and the reproduction and young stands following cutting and fire are, on account of the inflammable debris on the ground, especially exposed to destruction by fires. Rates of growth vary greatly in different parts of the Dominion, and, even if these were determined, the uncertainty of the fire-hazard in the present stage of forestry in Canada would preclude more than the expression of opinion as to the net annual increment. It has been estimated that in British Columbia twenty-two times as much timber has been destroyed by fire as has been cut for use, and, if the facts were known, they would show that similar conditions prevail in other provinces.

Though the loss of merchantable timber has been very greatly reduced in recent years as a result of the organization of forest-protective services, it still constitutes a serious drain on the forest resources. The annual consumption of standing timber for use amounts to about 2,600,000,000 cubic feet. At a very low estimate, fire destroys annually about 800,000,000 cubic feet of merchantable timber and the young growth on 1,300,000 acres. During the last ten years the destruction occasioned by the spruce bud-worm has averaged 1,345,000,000 cubic feet per annum besides the injury from bark-beetles and other insects. The loss due to fungi is not known but is undoubtedly large. It may be safely estimated that the forests of Canada are being depleted at the rate of upwards of 5,500,000,000 cubic feet per annum. With about 475,000,000 acres of potential, but at present unmerchantable, forest land, an average increment of 11.5 cubic feet per acre would supply this amount, but in view of the destruction of young growth which occurs and the deterioration of the forests and of the soil, caused by repeated fires, there is little ground for hope that this increment is being produced.

Statistics as to the quantity of wood and wood-products exported and imported are incomplete, and the total can only be estimated. The figures in Table VII must therefore be taken as approximate only.

TABLE VII—TOTAL CONSUMPTION OF TIMBER COMPARED WITH TOTAL INCREMENT

Type of Product	Utilization Table IV, Col. 3  Cubic feet	Exports Table VI, Col. 2  Cubic feet	Home consumption of home- grown timber Col. 2-Col. 3 Cubic feet	Imports Table VI, Col. 4  Cubic feet	Total home consumption of home and imported timber Col. 4+Col. 5 Cubic feet	Net increment Table III, Col. 8  Cubic feet	Balance Plus or Minus + or - Col. 7-Col. 6  Cubic feet
1	2	3	4	5	6	7	8
Lumber, Logs, Pulp- wood, Fuel, etc.....	2,325,000,000	660,000,000	1,665,000,000	50,000,000	1,715,000,000	Not available	Not available
Pulp and Paper.....	275,000,000	240,000,000	35,000,000	20,000,000	55,000,000	"	"
Total.....	2,600,000,000	900,000,000	1,700,000,000	70,000,000	1,770,000,000	"	"

This indicates a per capita consumption of approximately 200 cubic feet for a population of 8,788,438. Very nearly half of this represents wood used as fuel.

### B.—PROBABLE DURATION OF SUPPLIES

*Forest Resources.* For a large proportion of the forest area of Canada there is very little reliable information. Comprehensive surveys have been completed only for the Provinces of Nova Scotia and British Columbia, reports covering these Provinces having been published by the Commission of Conservation. An inventory of the forest resources of Ontario, commenced by that Commission, is being completed by the Forestry Branch of the Department of the Interior, in co-operation with the Ontario Department of Lands and Forests. The Forestry Branch has examined extensive areas of forest land in the three Prairie Provinces, but the information is still incomplete as to the total resources of these Provinces. For several years the New Brunswick Forest Service has been engaged in making a thorough survey of the Crown lands of that province, and about 60 per cent of these lands have been covered. The Quebec Forest Service is also collecting data as to the forests under its control, but as yet only a relatively small portion of the forest area of the province has been reported on.

From information secured from the various forest authorities the estimate given below of the total amount of each of the principal kinds of wood in Canada has been compiled. It must be borne in mind, however, that the estimate is based on insufficient data and that it is, therefore, subject to revision as more authentic information is available.



TABLE VII (a)—ESTIMATED STAND OF TIMBER OF MERCHANTABLE SIZE IN CANADA BY SPECIES

Species	Saw material	Pulpwood, fuel-wood, ties, poles, posts, etc.	Total
<i>Softwood</i>	1,000 cu. ft.	1,000 cu. ft.	1,000 cu. ft.
Spruce.....	25,264,715	44,783,154	70,047,869
Balsam fir.....	10,516,820	19,203,440	29,720,260
Jack pine.....	3,996,530	25,254,492	29,251,022
Cedar.....	17,979,240	4,065,761	22,045,001
Douglas fir.....	16,512,600	374,400	16,887,000
Hemlock.....	14,879,518	1,265,136	16,144,654
White pine.....	3,827,025	4,559,958	8,386,983
Red pine.....	866,145	1,632,735	2,498,880
Larch.....	732,115	710,184	1,442,299
Western yellow pine.....	876,000	117,000	993,000
Yellow cypress.....	876,000	117,000	993,000
Total.....	96,326,708	102,083,260	198,409,968
<i>Hardwood</i>			
Poplar.....	3,234,630	26,315,480	29,550,110
White birch.....	1,188,045	5,599,100	6,787,145
Yellow birch.....	2,278,695	3,003,550	5,282,245
Maple.....	1,359,114	2,671,125	4,030,240
Beech.....	401,979	741,734	1,143,713
Basswood.....	242,214	302,100	544,314
Elm.....	195,786	235,298	431,083
Ash.....	120,669	213,250	333,919
Cottonwood.....	172,572		172,572
Oak.....	43,143	58,330	101,473
Alder.....		4,750	4,750
Total.....	9,236,847	39,144,717	48,381,564
Grand Total.....	105,563,555	141,227,977	246,791,532

The forest resources are distributed approximately as shown in Table VII (b), from which it will be seen that the greater part of the saw-material is to be found in British Columbia, but including the small timber, suitable for pulpwood, railway ties, posts, and fuel, over 40 per cent of the forest resources of the Dominion is in the Eastern Provinces, namely, Ontario, Quebec, New Brunswick and Nova Scotia.

TABLE VII (b)—ESTIMATED STAND OF TIMBER OF MERCHANTABLE SIZE IN CANADA BY REGIONS

Region	Saw-material		Pulpwood, Cordwood, Posts, etc.	
<i>Softwood</i>	1,000 ft. B.M.	1,000 cu. ft.	1,000 cords	1,000 cu. ft.
Eastern Provinces.....	76,101,000	16,666,115	552,210	64,700,590
Prairie Provinces.....	17,985,000	3,938,715	272,010	31,825,170
British Columbia.....	345,762,000	75,721,878	47,500	5,557,500
Total.....	439,848,000	96,326,708	871,720	102,083,260
<i>Hardwood</i>				
Eastern Provinces.....	32,134,500	7,037,430	209,815	20,342,417
Prairie Provinces.....	9,305,000	2,037,795	196,010	18,620,950
British Columbia.....	788,000	172,572	2,160	205,200
Total.....	42,227,500	9,247,797	407,985	39,168,567
Grand Total.....	482,075,500	105,574,505	1,279,705	141,251,827

In estimating the time our supplies will last, there are several important factors which must be considered besides the total estimated stand and the amounts annually used and destroyed. It is quite probable that the estimates of mature timber will be reduced when a careful inventory is completed. There is a very considerable amount of timber for which, as far as can be seen, there is little chance of operating profitably. Certainly the virgin timber within reach of the established industries is rapidly becoming depleted, as evidenced by the long "drives," sometimes occupying two or three years, and the constantly increased cost of woods operations. This situation has led several of the pulp companies to undertake reafforestation measures. To an industry entailing large capital expenditure, such as the pulp and paper industry, the maintenance of appurtenant supplies of timber is of paramount importance. There is every indication that the demand for forest products will increase more rapidly in the future than in the past. The forestry situation in the United States indicates that there will be constantly increasing demands from that country. Their original forest area of 822,000,000 acres has been reduced to 463,000,000 acres, of which only 137,000,000 acres carries virgin timber. This is being cut at the rate of 5,500,000 acres per year, so that, exclusive of growth, there is only 25 years' supply in sight. The standing timber is being cut at the rate of 26,000,000,000 cubic feet per year, which is more than four times the estimated annual growth; the timber of saw-material size is being cut at the rate of 56,000,000,000 feet board measure per year, and the growth of such material is estimated at 9,500,000,000 feet board measure per annum.

In a recent report to the United States Senate, the Secretary of Agriculture said, "Three-fifths of the original timber of the United States is gone and we are using timber four times as fast as we are growing it. The forests remaining are so localized as greatly to reduce their national utility. The bulk of the population and manufacturing industries of the United States are dependent upon distant supplies of timber as a result of the depletion of the principal forest areas east of the Great Plains."

Already the United States is dependent upon Canada for two-thirds of its newsprint, and our total exports of wood and wood-products to the United States in 1922 were valued at over \$175,000,000. With the growth of population and decreasing supplies of timber in the United States, we must expect increased demand for our forest products, and we should be in a position to take advantage of this expanding and profitable market at our doors.

Canada is the principal source of coniferous timber within the British Empire, and our exports to other parts of the Empire and to the Orient and South America are rapidly increasing. With the growth of population in the Dominion, our needs for home consumption are bound to be greater, for, in spite of the use of substitutes, the use of wood continues to increase.

Though there is sufficient timber in Canada to maintain the present cut for many years, if all of it were exploitable, there is every reason to believe that the forest capital is being rapidly depleted, and if the increased demand is to be met, or even the present output maintained, and the forests of Canada placed on a sound basis of management, provision should be made without delay for the securing of sufficient net increment to meet the future requirements. The long time required for the growth of a merchantable stand of timber demands adoption of a forest policy far in advance of the immediate necessities.

#### C—STEPS WHICH SHOULD BE TAKEN TO PROTECT AND DEVELOP THE FORESTS

There is very urgent need in Canada for the adoption of a national forest policy, which will harmonize, in so far as it is possible, the administration of the forests throughout the Dominion. This can be accomplished only through the concerted action of the Dominion and Provincial forest authorities meeting in conference. No great improvement in the methods of handling the forest can be secured from localized action, since restrictions or regulations which place the operators of one region at a present disadvantage as compared with their competitors in other parts of the country cannot be expected to receive the popular support necessary for their successful operation.

Such a national forestry policy should include:—

1. The dedication of absolute forest land to the permanent production of timber. This involves the classification of the land and the exclusion of settlement from lands which are essentially suitable for forest purposes.
2. Legislation and organization sufficient to ensure adequate forest-fire protection. This involves
  - (a) a campaign of education to secure fire prevention
  - (b) the proper disposal of slash
  - (c) standardized equipment for the detection and suppression of fires.
3. The employment of cutting regulations designed to secure the most favourable conditions for the reproduction and growth of the more valuable species of trees.
4. The encouragement of the practice of forestry on private lands by the proper adjustment of taxation to meet the special needs of forest property and by furnishing advice and assistance in the establishment and care of the forests.
5. It is of the utmost importance that a complete inventory of the forest resources be secured at as early a date as possible in order that the Governments and the public at large may be fully informed as to the extent to which these resources have been depleted, and what the prospects are for future supplies, and also that the industries dependent on the forest may be guided in their development by a knowledge of the location and extent of both present and future sources of raw material.
6. In order that the forests may be handled in such a manner as to secure the highest sustained production, there is a great need for a definite knowledge of the silvicultural characteristics and requirements of Canadian forests. This knowledge can be secured only by painstaking research.



## APPENDICES

## A—LIST OF REPORTS OF COMMISSIONS AND COMMITTEES REPORTING ON FORESTRY AND FOREST QUESTIONS

- Forestry Commissioner (J. H. Morgan) to Minister of the Interior, 1884.  
 Royal Commission on Forest Protection in Ontario, 1897.  
 Royal Commission on Timber and Forestry, British Columbia, 1909-10.  
 Forestry Commission of Prince Edward Island, 1904.  
 Commission of Conservation (appointed as a result of the North American Conference on Conservation, February, 1909; discontinued, 1920).  
 Annual Reports, 1910-19.  
 Forest Conditions of Nova Scotia.  
 Conditions in the Clay Belt of New Ontario.  
 Forest Protection in Canada (1912-13).  
 Trent Watershed Survey.  
 Forest Protection in Canada (1913-14).  
 Wood Fuel to Relieve the Coal Shortage in Eastern Canada.  
 Forests of British Columbia.

## B—LIST OF LEGISLATIVE ENACTMENTS DEALING WITH FORESTRY AND FOREST QUESTIONS

- Dominion Forest Reserves and Parks Act, Dominion Lands Act, Railway Act.  
 Ontario Forest Reserves Act, Act to Preserve the Forests from Destruction by Fire and Woodland Tax Exemption Act.  
 British Columbia Forest Act, Timber Royalty Act.  
 Quebec Revised Statutes, Sections 1519 to 1745 (Chapter VI—Department of Lands and Forests, and matters connected therewith) and amending Acts.  
 New Brunswick Forest Act, and Forest Fires Act.  
 Forest Fires Acts of the provinces of Manitoba, Saskatchewan and Alberta.

## C.—LIST OF PUBLICATIONS ISSUED BY OR UNDER THE SUPERVISION OF THE FORESTRY AUTHORITY

- Publications of the Forestry Branch, Department of the Interior, Ottawa. (See accompanying List.)  
 Publications of the Dominion Bureau of Statistics, Department of Trade and Commerce (Annual Statistical Bulletins on Forest Products).  
 Annual reports of the Timber and Grazing Branch, the Commissioner of Dominion Parks, and the Dominion Board of Railway Commissioners.  
 Annual Reports of the Provincial Departments administering timberlands in British Columbia, Ontario, Quebec, New Brunswick, and Nova Scotia.  
 Publications of the Forest Services in British Columbia, Ontario, Quebec, and New Brunswick.

## FORESTRY BRANCH PUBLICATIONS AVAILABLE FOR DISTRIBUTION

Annual Reports of the Director of Forestry, 1914-15-17-18-19-20-21-22.

- Bulletin 1 —Tree-planting on the Prairies.  
 “ 11 —Forest Products of Canada, 1909: Lumber, Square Timber, Lath and Shingles.  
 “ 14 —Forest Products of Canada, 1909: Cross-ties.  
 “ 22 —Forest Products of Canada, 1910: Cross-ties.  
 “ 23 —Forest Products of Canada, 1910: Timber used in Mining Operations.  
 “ 27 —Forest Products of Canada, 1910: Cooperage.  
 “ 34 —Forest Products of Canada, 1911: Lumber, Square Timber, Lath and Shingles.  
 “ 35 —Forest Products of Canada, 1911: Poles and Cross-ties.  
 “ 36 —Wood-using Industries of Ontario.  
 “ 38 —Forest Products of Canada, 1912: Pulpwood.  
 “ 39 —Forest Products of Canada, 1912: Poles and Cross-ties.  
 “ 40 —Forest Products of Canada, 1912: Lumber, Square Timber, Lath and Shingles.  
 “ 46 —Forest Products of Canada, 1913: Pulpwood.  
 “ 48 —Forest Products of Canada, 1913: Lumber, Lath and Shingles.  
 “ 49 —Treated Wood-block Paving.  
 “ 51 —Game Preservation in the Rocky Mountains Forest Reserve.  
 “ 52 —Forest Products of Canada, 1913: (Being Bulletins 46, 47 and 48).  
 “ 53 —Timber Conditions in the Smoky River Valley and Grande-Prairie Country.  
 “ 54 —Forest Products of Canada, 1914: Pulpwood.  
 “ 56 —Forest Products of Canada, 1914: Lumber, Lath and Shingles.  
 “ 57 —Forest Products of Canada, 1914 (Being Bulletins 54, 55 and 56).  
 “ 58a—Forest Products of Canada, 1915: Lumber, Lath and Shingles.  
 “ 58b—Forest Products of Canada, 1915: Pulpwood.  
 “ 58c—Forest Products of Canada, 1915: Poles and Cross-ties.  
 “ 59 —Canadian Woods for Structural Timbers.  
 “ 60 —Canadian Douglas Fir: Its Mechanical and Physical Properties.  
 “ 61 —Native Trees of Canada. (Price 50 cents, post-free).

- " 63 —Wood-using Industries of Quebec.
- " 65 —Forest Products of Canada, 1917: Poles and Cross-ties.
- " 66 —Utilization of Waste Sulphite Liquor. (Price 50 cents, post-free).
- " 67 —Creosote Treatment of Jack Pine and Eastern Hemlock for Cross-ties.
- " 68 —Forest Fires in Canada, 1917.
- " 69 —The Care of the Woodlot.
- " 70 —Forest Fires in Canada, 1918.
- " 71 —Canadian Sitka Spruce: Its Mechanical and Physical Properties.
- " 72— Success in Prairie Tree Planting.
- " 73 —Tree-Repairing.
- " 74 —Distillation of Hardwoods in Canada. (Price 25 cents, post-free).
- Circular 5 —Planning a Tree Plantation for a Prairie Homestead.
- " 8 —The Forest Products Laboratories.
- " 9 —Chemical Methods for Utilizing Wood Wastes.
- " 12 —The Empire Timber Exhibition.
- " 13 —The Cascara Tree in British Columbia.
- " 14 —Commercial Forest Trees of Canada.
- " 15 —Historical Sketch of Canada's Timber Industry.
- " 16 —The Preservative Treatment of Fence-posts.
- " 17 —Forest-investigative Work of the Dominion Forest Service.
- Manual Methods of Communication Adapted to Forest Protection. (Price \$1, post-free).
- Dominion Forestry Branch Message Code. (Price 10 cents, post-free).
- The Talking Trees and Canadian Forest Trees (Juvenile).

#### D—PERIODICALS AND MISCELLANEOUS LITERATURE BEARING ON FORESTRY

- Canadian Forestry Magazine 1905—(established, 1905, as Canadian Forestry Journal. Name changed, 1920.)
- La Vie forestière et rurale, 1922—
- Reports of the Canadian Forestry Association (1900-1913).
- Reports of the Canadian Forestry Conventions of 1906 and 1911.
- Report of New Brunswick Forestry Convention, 1907.









